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EARLY MAN IN BRITAIN

EARLY MAN IN BRITAIN

AND

HIS PLACE IN THE TERTIARY PERIOD

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BY

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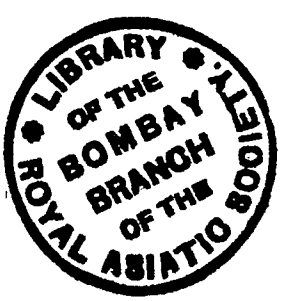

London

MACMILLAN AND CO.

1880

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Printed by R. & R. CLARK, *Edinburgh*

PREFACE.

In my work on "Cave-hunting," published in 1874, I endeavoured to clear the way for the present enquiry into primæval man, his growth in culture, his conditions of life, and his relation to history; and I found it necessary to treat of cave-exploration in detail, before I could venture to grapple with the difficulties inherent in a work which treats of the borderland of geology, archæology, and history. In dealing with them, I have to acknowledge my debt to the writings of Sir Charles Lyell, Sir John Lubbock, Mr. John Evans, Dr. Thurnam, and Mr. Franks in this country; to Professors Gaudry, Steenstrup, Capellini, and Drs. Broca, Virchow, Wiberg, Rütimeyer, Forsyth Major on the Continent, as well as to many contributors to the scientific periodicals of France, Switzerland, Italy, and Germany, and more especially to the valuable memoirs in the *Comptes Rendus du Congrès International d'Anthropologie et d'Archéologie Préhistoriques.* I have also used the materials accumulated in some of my own Essays published in the *Edinburgh* and *Fortnightly Reviews*, and in the *Quarterly Journal of the Geological Society.* I have attempted more particu-

larly to prepare myself for the present enquiry, by the examination of the more important Museums in France and Italy, and of some of those in Germany and Switzerland.

Among many friends who have aided me in various ways, my thanks are more particularly due to Mr. A. E. Dobbs for revising the proofs; to Dr. R. Angus Smith, and Messrs. R. D. Darbishire, John Evans, J. F. Philips, A. W. Franks, Worthington, G. Smith, and Marcus M. Hartog, for assistance of various kinds in the letterpress. For the use of many wood blocks, I have also to thank Messrs. Cheadle, Pengelly, Gardner, Greenwell, Evans, Mello, Franks, Parker, Williams and Norgate, General Lane Fox, and Professor Daniel Wilson, as well as the Councils of the Geological Society of London, of the Society of Antiquaries, and of the Plymouth Institution. And lastly, I have to thank Mr. Rowe, a young and promising artist, for the care with which he has represented the groups of Eocene, Meiocene, and Pleiocene life.

In laying this book before my readers, I am conscious of its many defects, arising to some extent from the nature of the subject, and from the swiftness with which our knowledge of Early Man is being enlarged by new discoveries.

W. B. D.

Owens College, Manchester,
1st Jan. 1880.

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115 Bronze Dagger-blade, Barrow, Camerton, Somerset, ⅔ 345
Do. Fig. 157.

116 Bronze Axe in Handle 350
Lane Fox, *Royal United Service Inst.* xiii., Primitive Warfare, Jan. 10, 1869, Fig. 117.

117 Palstave, Nettleham, Lincolnshire, ½ 350
Evans, *Petit Album de l'Age du Bronze*, iv. p. 2.

118 Bronze Axe in Handle 350
Lane Fox, *Op. cit.*, Fig. 118.

119 Flanged Axe, Arreton, Isle of Wight, ½ 351
Thurnam, *Archæologia*, xliii. Fig. 148.

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120 Bronze Axe in Handle 350
Lane Fox, *Op. cit.*, Fig. 120.

121 Socketed Celt, Thames, Kew, ½ 351
Evans, *Petit Album de l'Age du Bronze*, Pl. vi. Fig. 1.

122 Bronze Hair-pin, Wandle 356
Franks, *Archeol. Journ.* ix. p. 7.

123 Amber Necklace, Lake, Wilts, ¾ 357
Thurnam, *Archæologia*, xliii. Fig. 194.

124 Gold Beads, ½ 357
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125 Strike-a-light, Seven Barrows, Lambourne, ⅔ 358
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Wilson, *Prehistoric Annals of Scotland*, Fig. 70.

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Thurnam, *Archæologia*, xliii. Fig. 83.

128 Incense Cup, Bulford, Wilts, ⅔ 361
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130 Thurnam, *Archæologia*, xliii. Fig. 177.
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CORRECTIONS AND ADDITIONS.

Page 10, lines 12, 16, 19, *for* grave accent, *read* acute.

„ 17, line 15, *before* "con" *insert* "and."

„ 22, „ 21, *for* "500," *read* "from 500 to 600."

„ 39, „ 6, *for* "squirrels," *read* "Rodents, the Viverra, Mustela, Rhinoceros."

„ 40, in Lower Meiocene Table *insert* "Viverra, Mustela, Rhinoceros."

„ 57, line 25, *for* "Eocene," *read* "Meiocene."

„ 84, note, *for* "*florentinus.* Cocchi, *Aulaxinus*," *read* "(*Aulaxinus*) *florentinus*, Cocchi, and a second not yet named."

„ 90, line 11, *for* "Pleiocene," *read* "Pleistocène."

„ 95, „ 20, *insert* "?"

„ 104, „ 19, *dele* "Falconer's elephant."

„ 113, „ 28, *dele* "the."

„ 128, „ 21, *insert* "?"

„ 128, *to* "New Comers" *add* "the squirrel, *Sciurus vulgaris*, Lin."

„ 138, line 5, *dele* "pouched."

„ 147, *to* "Survivals — Living Species" *add* "Musk sheep," *and to* "Extinct Species" *add* "Machairodus."

„ 213, fig. 77, *for* "Duruthy," *read* "Laugerie Basse."

„ 239, „ 94, *for* "Haute," *read* "Basse."

„ 259, line 11, *dele* "and Ireland."

„ 478, The abundance of apples mentioned by Pytheas in Thule proves that Thule was not either Iceland, the Faröes, the Hebrides, or the Orkneys, but, as Nilsson remarks, the south of the Scandinavian Peninsula.

EARLY MAN IN BRITAIN.

CHAPTER I.

THE RELATION OF GEOLOGY TO ARCHÆOLOGY AND HISTORY.

The Continuity between these three Sciences.—The three Phases of Life on the Earth.—These three Phases universal.—Breaks in the Succession accompanied by Geographical Change.—The History of Tertiary Life ends with Man.—The Classification of the Tertiary Period.—The Specialisation of the Mammalia explained by the Theory of Evolution.

Of the many fields of inquiry opened out by the intense mental activity of this century, there is none which promises to be more fruitful than that which has been won by the joint labours of the geologist, the student of prehistoric archæology, and the historian. The geologist, beginning his story of the earth at the time when the rains first descended and the seas first began to beat on the coast-lines, has laid, as it were, in a map before us the revolutions in climate and geography that it has undergone. He tells of continents submerged, and of ocean bottoms lifted up to become mountains; and he points out to us that side by side with the ever-changing conditions of life there were corresponding changes in the living forms. Group after group of animals and

plants pass over the field of vision, each connected with that which preceded it, and each becoming more and more highly organised, until man appears the last born as well as the highest and the noblest creature in the realm of geology.

The archæologists in the meanwhile have raised the study of antiquities to the rank of a science by the use of a purely inductive method, and have accumulated materials which enable us to establish a tolerably complete sequence of events from the remote past in which man stands in the geological foreground down to the borders of history. To them we owe the knowledge of the steps by which man slowly freed himself from the bondage of the natural conditions under which all other creatures live; of the successive discoveries of the use of polished stone, bronze, and iron; of the domestication of animals; of the cultivation of the fruits of the earth; of the introduction of the arts; in a word, of all those things by which man has become what the historian finds him.

The writers of history — Freeman, Green, Stubbs, Guest, and others—have carefully sifted the true from the false, the certain from the uncertain, in the records of this country, and have consolidated, so to speak, their domain, so that it can be used by the archæologist as a base for the conquest of what lies beyond. If, however, in this respect, archæology be indebted to historical criticism, she is now in a position to repay the debt with ample interest. In the pages of the historian, man appears in the high state of civilisation marked by the use of letters, and the written record is silent as to his progress up to that point. The steps by which that civilisation was achieved are pointed out by prehistoric archæology, and these are traced back until man is

discovered living under conditions wholly unlike those which are now experienced in this country, under a different climate and a different geography, and surrounded by wild animals, for the most part unlike any now to be found in Europe.

The Continuity between these three Sciences.

The continuity between geology, prehistoric archæology, and history is so direct that it is impossible to picture early man in this country without using the results of all these three sciences. The history of the earth is necessary to the history of man, if a broad view be taken instead of a narrow specialism flowing from the tendency of the age towards minuteness of detail. In the earliest records the inhabitants of this country, about two thousand years ago, are represented as being similar in their habits and modes of life to their neighbours in Gaul, and we gather from Cæsar's *Commentaries* and the *Agricola* of Tacitus that they were composed of the same Belgic, Celtic, and Iberic tribes, in the stage of culture marked by the use of iron,—foes by no means despicable to the Roman legions. The accounts, however, which have been handed down to us have been written merely from a military point of view, and from them we learn very little of the life, of the arts and habitations of the Britons of those times, and still less of the condition of the country, of the extent of forest and morass, and of the wild animals which they sheltered. On all these points modern discoveries draw aside the veil, and we can form almost as clear an idea of the inhabitants before the landing of Julius Cæsar, and of their internal and external relations,

as we can of those who dwelt in Britain for the first two centuries afterwards. We know that they carried on a commerce and possessed a coinage, how they lived, and how they buried their dead. The tomb on the lonely moor or the swelling chalk-down, the habitation within the earthen or rock-built rampart, the camps in the best military positions commanding the pastures, the discoveries in dredging the rivers or in draining the morasses, offer the materials for bringing the life of those men before our eyes. But we can do more than this; we can indicate their advance in culture and the changes wrought in their conditions of life. We can follow them back to a time when they were on the continent, and trace their westward progress over Europe from their ancient Eastern home, from the birthplace of the nations, Asgard, the mystic Garden of Eden. We can prove that they were composed of two distinct elements, the older or the non-Aryan Iberic, and the later or the Celtic, forming the vanguard of the great army of the Aryan invaders; we know to what extent our civilisation is due to them, and how they were influenced by the civilised peoples of the Mediterranean, Phœnicians, Greeks, Etruskans, and Romans. The ancient routes of trade, leading from the Mediterranean and Black Sea northwards as far as Scandinavia and Britain, have also been traced, and we can indicate with tolerable precision what we may term the overlap of history. We are now able to realise that, while Egypt and Assyria were highly civilised and mighty empires, while the Greeks were extending their influence and power over the Mediterranean, while the Etruskans still ruled over Lombardy, and while the Phœnicians were pushing their trade farther and farther northwards along the shores of

the Atlantic, the inhabitants of middle Europe were gradually passing from the Bronze stage of culture into that of Iron. The knowledge of Bronze was spreading northwards, and the lower Neolithic civilisation, characterised by the use of polished stone, and the ignorance of metals, formerly universal, was disappearing from the more remote portions of the continent.

Our inquiry into the progress of man reaches back to a time far more distant than any of these events. Before our ancestors were in Europe, and before our country was an island, there were Palæolithic tribes in Britain, ignorant of the use of polished stone and of the metals, without domestic animals, living solely by the chase, fishing, and fowling; of these, the older or the River-drift men, have left evidence that they wandered over the greater part of western and southern Europe, over North Africa, Asia Minor, and over the whole of India; while the newer, or the Cave men, have been traced over a large part of Europe. Their mode of life, and their relation to living races of men, the time of their arrival in Europe as marked in the geological record, and their surroundings, cannot fail to be of high interest to all thoughtful men.

In dealing with these difficult questions I propose to place before the reader a definite idea of the various changes which have taken place in Britain before the written record, and to make early man the central figure in the pictures of the successive changes presented by geology and prehistoric archæology. I have adopted the historical method of beginning with the earliest and working downwards with the current of events, rather than that more usually adopted of ascending the stream of time from the point of departure offered

by the written record. The appearance and disappearance of successive groups of wild animals, the varying climate and geography, the successive invasions of tribes, the gradual development of civilisation, fall within my scope. The materials necessary for this task are perplexing in their abundance, and lie scattered over a wide field; the progress of discovery is very swift, and there are great blanks in the story yet to be filled in. Nevertheless, after a preparation of many years by researches in this country and on the continent, it seems to me to be better to attempt to perform the task, however imperfectly, rather than to wait for that perfection which perhaps might never come.

The three Phases of Life on the Earth.

The history of life in Europe falls naturally into three great divisions, separated from each other by breaks of great magnitude. In the first or Primary, fishes and amphibians, and in the upper part a few reptiles, were the master beings which have left their traces buried in the rocks. The vegetation, now principally represented by the coal seams, consisted of pines, *araucariæ*, tree ferns, and gigantic trees (*Sigillaria* and *Lepidodendron* and *Calamites*), allied to the club mosses and mares-tails. In the second or Secondary, reptiles had the mastery, walking on the land as giant carnivores and herbivores (*Iguanodons* and *Megalosauri*), flying in the air as pterodactyles, or huge reptilian bats, swimming in the sea as great reptilian whales, seals, and walruses (*Ichthyosauri*, *Pleiosauri*, and *Plesiosauri*). The birds are represented by the *Archæopteryx* of Solenhofen, with a long tail like that of a reptile, and in the Creta-

ceous rocks of America by the *Odontornithes* or birds with teeth in their beaks.[1] The remarkable combination of characters in these two widely-different forms renders it probable that the class Aves was not sharply defined from the class Reptilia in the Secondary period. The only mammalia which have been discovered are small marsupials, the largest of which was not larger than a kangaroo-rat. The forests then covering Europe consisted principally of *coniferæ, araucariæ, zamiæ,* and cycads, and trees with deciduous leaves do not appear until the Cretaceous or concluding phase of the period. In the third or Tertiary period, the higher placental mammals first appear, taking the place of the reptiles of the Secondary in their mastery of land and sea, and flying in the air as bats. The true birds also have left the reptilian characters far behind, and in the vegetable kingdom the angiosperms, both evergreen and with deciduous leaves, increase and multiply, until they assume their present important place in the forests of the world.

These three Phases universal.

These three phases of life may be traced over the whole earth, and their succession is invariable, from which it may be inferred that they are due to causes acting universally, and not sporadically in one or more centres. They prove that the earth as a whole has passed through a series of biological changes, analogous to those which are to be seen in the animal world in the passage from birth to old age. They may be accounted for on the theory of evolution of Herbert Spencer and

[1] Marsh, *American Journal of Science and Arts,* x. Nov. 1875.

Darwin, that while the conditions of life were ever changing, those animals and plants which were not sufficiently plastic to conform to a new state of things died out, while those which were more capable of modification, so as to be in harmony with their surroundings, became what we know as new species, genera, families, orders.

Breaks in the Succession accompanied by Geographical Changes.

The succession of living forms has been uninterrupted, although, from errors of observation, as well as from the fragmentary nature of the evidence, it appears to be broken. Each break may be likened to places from which pages, or chapters, or whole volumes, as the case may be, have been torn out from the record by the hand of time, or not yet discovered by man. It must also be observed that the breaks in the succession are invariably accompanied by geographical change of corresponding magnitude. That, for example, which took place at the close of the Secondary period consisted in the elevation of the chalk rocks, which were accumulated at the bottom of the Cretaceous ocean, extending from southern and eastern Britain, through France into the Mediterranean area, Greece, Palestine, Asia Minor, Germany, Russia, and far into Asia, so as to form a continent on which the Eocene mammalia make their appearance. In this case the conditions of life must have been profoundly modified by the geographical change. The climate must have been altered, and forms of life, which had been previously elaborated outside Europe, would enter into competition with the old

European forms on the new continent. The contrast between the Secondary and the Tertiary faunas is enormous and proportionate to the geographical change, but it is not so strongly marked in the floras, which have changed more slowly.

The History of Tertiary Life ends with Man.

The third or Tertiary period is that which more immediately concerns us. In it each life-group is so closely linked to that which went before and followed after, that there is no break of sufficient importance to be used for a starting-point in our special inquiry into the ancient history of man. We shall therefore be compelled to treat in outline the principal changes which took place in this country from the beginning of the Tertiary period down to the time when man first appeared upon the stage, and to see how they are related to the varying conditions of life on the continent.

The Classification of the Tertiary Period.

The Tertiary period in Europe may be divided into six well-defined stages, as I have pointed out in my work on *Cave-hunting*.

	Characteristics.
I. Eocene, or that in which the mammalia now on the earth were represented by allied forms belonging to existing orders and families.	Living orders and families present.
II. Meiocene, in which the alliance between living and fossil mammals is more close than before.	Living genera.
III. Pleiocene, in which living species of mammals appear.	Living species.

	Characteristics.
IV. Pleistocene, in which living species are more abundant than the extinct. Man appears.	Living species abundant. Man appears.
V. Prehistoric, in which domestic animals and cultivated fruits appear, and man has multiplied exceedingly on the earth.	Man abundant. Domestic animals. Cultivated fruits.
VI. Historic, in which the events are recorded in history.	Historical record.

The Tertiary or Kainozoic strata were divided by Sir Charles Lyell,[1] in 1833, into three great groups, according to the percentage of existing mollusca, which was presented in a comparison of 3000 fossil with 5000 living forms. The Eocene (ἠώς dawn, καινὸς new), or the earliest group, contained about 3½ per cent of living shells, and thus, to speak metaphorically, was characterised by the dawn of the Testaceous fauna, now living in the sea. In the Meiocene (μείων less, καινὸς) group the existing forms were much more abundant, being always less than 35 per cent. The upper group was termed Pleiocene (πλειὼν more, καινὸς), because it presented from 35 to 50 and even 90 per cent of living testacea. The vast number of fossil species which have since been added to those which formed the basis of this classification has not materially altered its value, but merely rendered the strict definition of the percentages impossible.[2] The term Pleistocene (πλειστὸς most, καινὸς) was subsequently applied by Sir Charles Lyell to assemblages of fossil species in which there was a still nearer approximation to existing nature.

1 *Principles*, 1st edit., vol. iii., 1833. *Antiquity of Man*, 1st edit., p. 3.

2 See also Dawkins' *Preliminary Treatise, British Pleistocene Mammalia*, Palæont. Soc., 1878, pp. iv. v.

The idea of percentages of living among extinct species implied by the etymology of the first four terms has been so modified by modern discoveries that I have substituted for the more usual definitions those which are in harmony with our present knowledge, taking the most highly specialised animals as my guides, which alone have changed swiftly enough to be used to classify the subdivisions of the Tertiary period. The Prehistoric and Historic stages constitute the Recent division of Lyell and most other authors, and the evidence on which they, as well as the Pleistocene, are included in the Tertiary period will be placed before the reader in the course of this work.

The Specialisation of the Mammalia explained by the Theory of Evolution.

The argument in favour of the theory of evolution, founded on the specialisation of mammalian life, in its progress from the Eocene times down to the present day, seems to me so strong as to be almost irresistible. The facts are put into a tangible shape in the accompanying diagram (Fig. 1), in which it will be observed that the orders, families, genera, and species fall into the shape of a genealogical tree, with its trunk hidden in the Secondary period, and its branchlets, the living species, passing upwards from the Pleiocene, Pleistocene, and Prehistoric stages to the present time—a tree of life with living mammalia for its fruit and foliage. Were the extinct species taken into account, it would be seen that they fill in the intervals separating one living form from another, and that they grow more and more like the living forms as they approach nearer to the present day.

These facts appear to me inexplicable on any other theory than that of evolution.

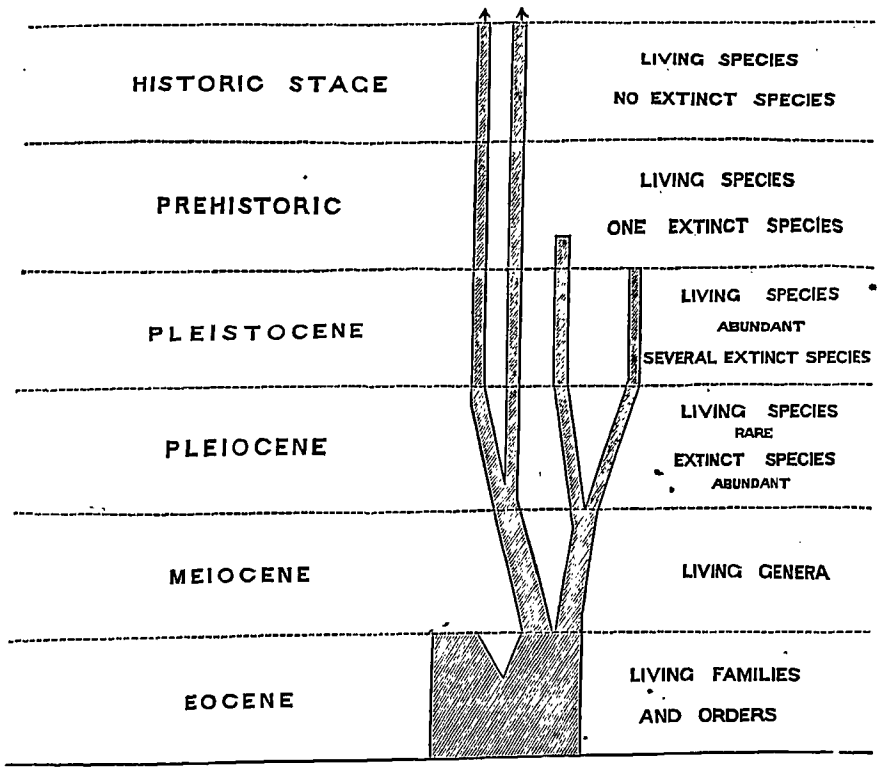


FIG. 1.—Specialisation of Mammalia in Tertiary Period.

No similar series of changes such as these has been observed in the reptiles, amphibians, fishes, or in the Invertebrates of the Tertiary strata, nor is it clearly marked in the Tertiary vegetation. In the birds, however, a similar specialisation has been pointed out by Professor Milne Edwards. The living orders, families, and genera of the lower Vertebrates had already appeared in the Primary and Secondary periods; first, the lower and afterwards the higher forms, preserving in their successive appearances the order in which they are arranged in the classification of the naturalists.

CHAPTER II.

BIOLOGICAL AND PHYSICAL CHANGES IN BRITAIN BEFORE THE ARRIVAL OF MAN.—THE EOCENE PERIOD.

The Eocene Classification.—South-Eastern Coast-Line of Britain.—Eocene Sea-Board of Britain.—The Eocene Sea.—Britain connected with America.—The Mountains.—The Rivers.—The Lower Eocene Plants and Animals.—The Lower Eocene Birds.—The Mid Eocene Flora.—The Mid Eocene Mammalia.—British Upper Eocene Mammals.—Upper Eocene Mammalia of the Continent.—The Order Primates represented.—Climate of Britain Tropical.—General Conclusions.—Man not here.

THE close of the Secondary age, as we have observed in the preceding chapter, was marked by great changes in the physical geography of Europe. The cretaceous rocks, which had been formed at the bottom of a deep sea, were lifted up above the waves, and plants and animals hitherto unknown appeared on the new continent. The new invaders took possession of the land, the air, and the sea, and brought about as marked a change in the European fauna as that in geography which had preceded their arrival.

It is very probable that the elevation of the bottom of the sea, by which this immigration of new forms became possible, was accompanied by a corresponding depression of a neighbouring tract of land, like that

which took place in the Pleistocene age,[1] when the Sahara Desert was covered by the sea, and a large part of the Mediterranean area was dry land, or like that now taking place in the Scandinavian peninsula, which is being lifted up from the North Cape to Stockholm, and depressed in the south, in Scania.[2] New conditions of life were produced by these changes, so unfavourable for the Secondary animals, that all the higher forms perished that were unable to compete in the struggle for life with the new invaders, whose presence marks the Eocene period. The invasion of Europe by the placental mammals is the great event which is the natural starting-point for our enquiry into the ancient history of man, since the conditions by which he was surrounded on his arrival in Europe, form part of a continuous sequence of changes, from that remote period down to the present day. Each of these changes in life and geography will be treated in outline in its due place in this work.

The Eocene Classification.

The Eocene period has been defined in the last chapter as that in which the existing orders and families of the placental mammalia appear for the first time. The Eocene marsupials, however, are, as may be expected from their class having appeared in the Secondary age, in a far more advanced stage of evolution, being represented by a living genus,[3] the opossum, as well as by

[1] Chapter V. of this work ; *Cave-hunting*, 110.

[2] Lyell, *Principles*, 131.

[3] According to Gervais it belongs to an extinct genus *Peratherium* (*Zool. et Pal. Franc.*, 4to). In this chapter, however, the views of Gaudry are followed (*Les Enchainements du Monde Animal*).

other forms intermediate between the marsupials and the true placental mammals.

The Eocene strata[1] are found in the area to the south-east of a line passing from the Wash to Charmouth in Dorsetshire, and are mainly centered in two basins, named, respectively, that of London, and that of Hampshire and the Isle of Wight. They occur over a very wide area on the continent. They are divided into three groups, the lower or Pre-nummulitic, the middle or the Nummulitic, and the upper or the Post-nummulitic, the widely spread foraminifer, *Nummulites* (Fig. 2), offering a ready means of determination of age, not merely in Europe, but throughout Asia, and a large part of Africa. The following table represents the thickness, characters, and conditions of deposit of each of the subdivisions in England, together with their equivalents in France, as determined by the recent researches of Professor Gaudry.

FIG. 2.
Nummulites lævigata.
Bracklesham, ½.

[1] For a systematic account of the Eocene strata, see Lyell, *Student's Elements*, c. xvi.

Classification of British Eocene Strata.

1. *Upper Eocene or Post-nummulitic = Proicène (Gervais).*

	Thickness in Feet.	Conditions of Deposit.	French Equivalents (Gaudry).
Hempstead Marls, Clays, Sands	170	Freshwater, Estuarine, Marine.	
Bembridge Marls, Sands, Limestone	80	Freshwater, Estuarine, Marine	6e Étage du Gypse de Paris.
Osborne or St. Helena Marls, Clays	100	Freshwater, Estuarine.	
Headon Marls, Sands, Clays	260	Freshwater, Estuarine, Marine.	

2. *Middle Eocene or Nummulitic = Eocène (Gervais).*

Barton Sands, Clays	300	Marine	5e Étage des Sables de Beauchamp.
Bracklesham / Bagshot Sands, Clays	?	Marine	4e Étage du Calcaire Grosier de Paris.
Alum Bay and Bournemouth Sands, Clays	?	Freshwater, Estuarine, Marine.	

3. *Lower Eocene or Pre-nummulitic = Orthrocène (Gervais).*

London Clay	480	Estuarine, Marine	3e Étage des Sables de Cuyse-la-Motte, Sables de Soissonnais.
Woolwich and Reading Sands, Clays, Plastic Clays	58	Freshwater, Estuarine, Marine	2e Étage des Lignites du Soissonnais.
Thanet Sand	39	Marine	1e Étage des Gres de la Fère.

South-Eastern Coast-Line of Britain.

We may gather from the alternation and repetition of beds deposited by fresh, brackish, and salt water, in the above table, the important fact that south-eastern England was traversed by a fluctuating shore during the whole of the Eocene age, while to the north-west of the line above mentioned there were no geographical changes sufficiently great to leave any permanent mark in the geological record. On the continent, however, great oscillations of level took place. The Pre-nummulitic age was a period of elevation, followed in the Nummulitic by a great depression beneath the waves of the sea, followed in its turn by a period of re-elevation. None of these movements have left any trace in Britain, in the area to the north-west of the above-mentioned line, consequently this may be taken to be that of the Eocene sea-board of Britain. Its exact position varied from time to time, and considerable additions were made to the land, more particularly in the Post-nummulitic times, by the accumulation of shoals and alluvia, like those by which large tracts have been added to Great Britain since the invasion of the Romans, such as that joining the Isle of Sheppey to the mainland of Kent, or that which has converted the Roman port of Anderida into the green pastures running close under the ramparts of Pevensey Castle. By this means, as well as by movements of elevation and depression, frequent changes took place in the shallow Eocene sea.

The Eocene Sea.

We have no evidence that the Eocene sea touched

any part of the present area of Great Britain, excepting that represented in the Map (Fig. 3) in its period of maximum extension.

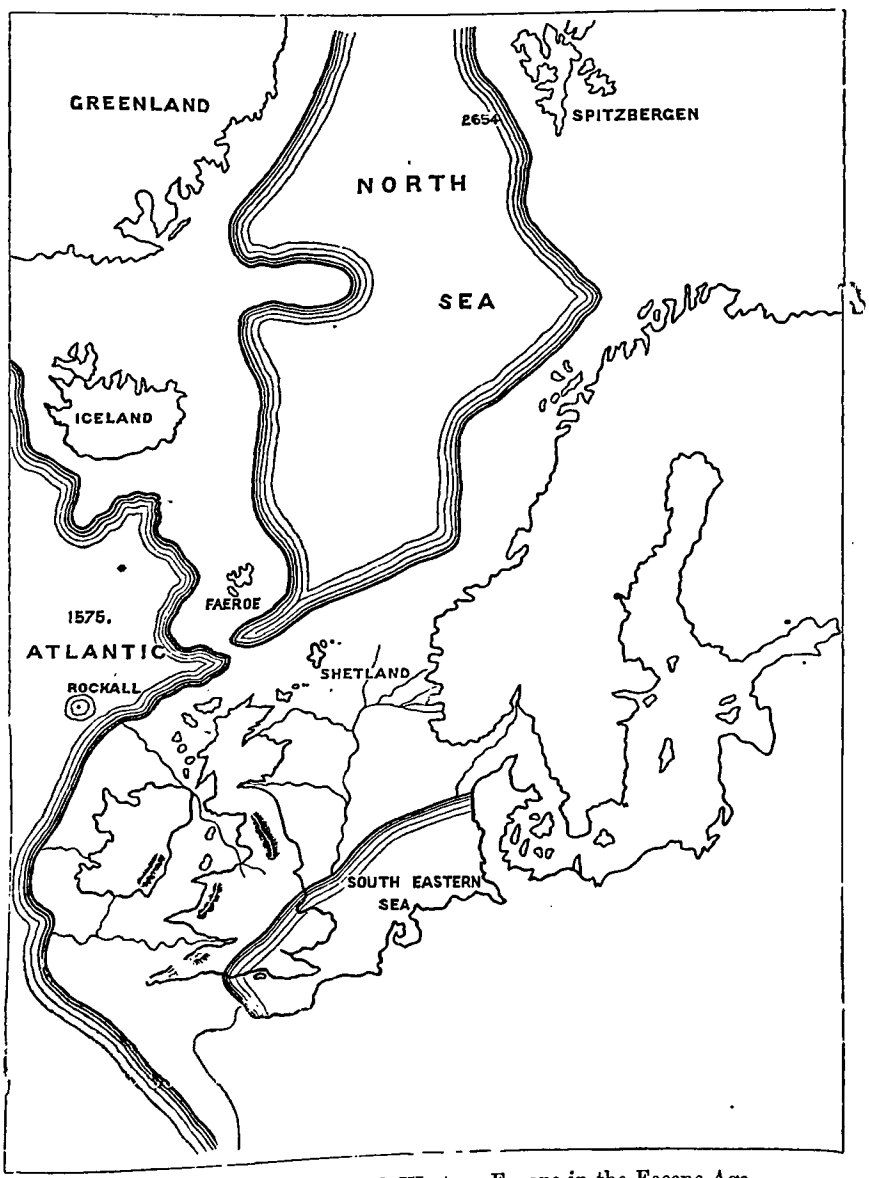


FIG. 3.—Geography of North-Western Europe in the Eocene Age.

According to the observations of Mr. Sorby[1] on the marine currents, the sea in which the Post-nummulitic rocks of the Isle of Wight were deposited was shut off from the Atlantic by a barrier of land running due south from Dorset, Devon, and Cornwall, towards Normandy and Brittany, the main body of the ocean being to the east or south-east, and extending at least as far to the north as Denmark.

This sea teemed with life of various kinds, now to be found, for the most part, in the warmer regions of the ocean. Gigantic sharks, rays, sword-fishes, and sturgeons, and the peculiar armour-clad fish the *Lepidosteus*, found their prey in vast abundance. There were turtles also innumerable, and sea-snakes, some of which (*Palæophis*) were twelve feet long. Among the more important mollusca we may notice the nautilus, the cone, volute, cowrie, olive, and large spindle shells (*Fusus*), which belong to the marine fauna of the tropics.

The Eocene lakes, rivers, and seas were singularly rich in reptilian life. "More true turtles," writes Professor Owen,[2] "have left their remains in the London Clay, at the mouth of the Thames, than are now known to exist in the whole world; one (*Chelone gigas*) is of enormous size, with a head upwards of a yard across. *Emys* and *Platemys* haunted the rivers, while the estuaries were the feeding-places of the soft turtles (*Trionyx*), and basking on the shores were to be seen crocodiles, alligators, and the long-snouted gavial, now only living in the rivers of India."

[1] "Physical Geography of the Tertiary Estuary of the Isle of Wight," by H. C. Sorby, Esq. *Edinb. New Phil. Jour.* N.S. April 1857.

[2] Owen, *Palæontology*, p. 281.

Britain connected with North America.

From the coast-line above mentioned the land extended northwards and westwards, far away from our present shores, and is proved by the examination of the forests and of the animals to have been continuous with the North American continent. The chief botanists[1] of the present time—Hooker, Dyer, Saporta, Dawson, and Asa Gray—are agreed that the north polar region was the centre from which the Tertiary floras have been dispersed over the new and old worlds. According to Saporta, the marked difference between summer and winter in the polar regions has first left its impress in the dicotyledons with deciduous leaves, which were unknown on the earth before the Cretaceous age. Their introduction was the greatest revolution in the vegetable kingdom, as yet observed; and when once evolved they increased rapidly in numbers and diversity of forms. As the polar temperature was lowered, the trees of warm habit were pushed farther and farther south, away from their original birthplace, and ultimately only survived in isolated districts, now separated from each other by great tracts of sea, or great areas of desert or of mountain. In consequence of this there is an almost unbroken sequence to be observed in the floras succeeding each other in the northern hemisphere, from the Eocene age down to the present day. "There is no great break," as Mr. Starkie Gardner observes, "in passing from one to the other, when we compare them over many latitudes, and but little change beyond that brought about by altered

[1] Hooker, *Proceed. Royal Soc.* xxviii. p. 51. Saporta, *Les Anciens Climats de l'Europe et le Developpement de la Végétation.* Association Française, Havre, 1877. Dawson, *Princetown Rev.* 1879, p. 182.

temperature or migration. If Tertiary floras of different ages are met with in one area, great changes, on the contrary, are seen; and these are mainly due to progressive changes in climate. From middle Eocene to Meiocene the heat imperceptibly diminished. Very gradually the tropical members of the flora disappeared; that is to say, they migrated; for most of their types, I think, actually survive at the present day, many but very slightly altered. Then the sub-tropical members decreased, and the temperate forms, never quite absent even in the middle Eocenes, preponderated. As decreasing temperature drove the tropical forms south, the more northern must have pressed closely upon them. The northern Eocene, or the temperate floras of that period, must have pushed from their homes in the far north more and more south as climates chilled, and at last, in the Meiocene time, occupied our latitudes. The relative preponderance of these elements, I believe, will assist in determining the age of Tertiary deposits in Europe, more than any minute comparisons of species. Thus it is useless to seek in the Arctic regions for Eocene floras, as we know them in our latitudes; for during the Tertiary period the climatic conditions of the earth did not permit their growth there."[1]

Before such a migration of plants as this could take place there must have been land extending far north, so as to bring Europe into close relation with the Polar regions. The position of this ancient continent is indicated by the fossil floras of Iceland, Greenland, and Spitzbergen, which flourished in those latitudes in the Eocene, and subsequently established themselves in Europe in the Meiocene age, as we shall see in the next

[1] *Nature* xx. 12.

chapter.[1] Mr. Starkie Gardner places the land barrier which shut off the Atlantic from the Arctic Sea, between the 60th and 70th degrees of N. latitude, or in the position in which it is represented in the accompanying map (Fig. 3).[2]

The forms of animal life also common to Britain and America prove a connection between the two regions in the Eocene age. The opossum of Eocene Britain, the extinct *Coryphodon*, *Lophiodon*, Anchithere, and Anoplothere, are common to both, and the alligator, which haunted the rivers of the south of England, the bony pike, the last representative of the armour-clad fishes of the Secondary period, and a little snail (*Helix labyrinthica*), have found a refuge in America from those agencies by which they have been exterminated in Europe.

For the migration of these animals there must have been a continuous tract of land between Britain and America; and the direction of this is pointed out by the soundings in the Atlantic and the Northern seas (see Map, Fig. 3). It is indicated by the ridge of land at a depth of 500 fathoms sweeping away northwards from the west of Ireland, past the Färoe Islands to the south of Iceland and Greenland. On the eastern side of this the observations taken in the Norwegian Deep Sea Expedition in 1877 prove the existence of deep water between Jan Mayen Land and Spitzbergen, and between that

[1] If the fossil floras of the Polar regions be judged from the standpoint offered by the decrease of temperature from the equator towards the pole, they are Eocene. If, however, we look at them, *homotaxially*, from the point of view offered by the European Meiocenes, they are Meiocene. Mr. Starkie Gardner takes the former, Dr. Heer the latter, view. See Starkie Gardner, *Nature*, xix. 124; xx. 10.

[2] This map was drawn in 1875, and its accuracy is confirmed by the independent reasoning of Mr. Starkie Gardner.

island and Norway; the soundings being respectively 2650 and 1760 fathoms.[1] The elevation of this tract of land would afford a means of free migration of animals and plants from Europe to America, or from America to Europe. I have therefore taken the 500-fathom line to mark the probable boundary of the Eocene Atlantic, as well as the southern extension of the Eocene North Sea in the direction of the Shetlands. The enormous depth of the Atlantic between Ireland and the United States forbids the hypothesis that the line of communication was in that direction.

From these considerations Eocene Britain may be taken to have formed part of a great continent, extending northwards and westwards to America by way of Iceland and Greenland, while to the north-east it was continuous with Norway and Spitzbergen. It extended also to the south-west, across what is now the Channel, to join the western parts of France. This great north-western continent, or northern Atlantis as it may be termed, existed through the Eocene and Meiocene ages, offering a means of free migration for plants and animals, and it was not finally broken up by submergence, as we shall see in the course of this work, until the beginning of the Pleiocene age.

The Mountains.

The highlands of Britain in the Eocene age were in their present positions. The older Palæozoic strata of Cornwall, Wales, Cumberland, and Scotland had already been cut up into hill and valley before the deposit of the Triassic rocks, and constituted a broken chain of

[1] H. Mohn, *Nature*, vi. p. 526.

mountains on the west, during the whole of the Secondary period. The Pennine range, the backbone of England, was then very much as it is now, with its limestone cut into deep cañons or dales in the areas of Derbyshire and Yorkshire, and with the massive carboniferous sandstones rising into rugged heights, and traversed by deeply cut glens. The hills of Somerset, Devon, and Ireland also, were the same, and the surface contours of the lower ground must have been to a large extent what they are now, since they were carved by those agents by which the present hills and valleys have been formed. There are, however, differences to be remarked. The mountains were higher[1] and more precipitous, and the landscape could not, in those times, have offered the flowing lines and curves, which have been produced by ice, in the present surface. Nor must it be forgotten that in the long lapse of ages the whole of the Eocene land-surface has been removed by the action of those denuding agents, which we shall bring before our readers in treating of the Meiocene mountains.

From Professor Judd's observations on the western districts of Scotland, it is evident that the volcanic energy which raised a range of lofty volcanic mountains in the Western Isles in the Meiocene age, was felt in the same districts in the Eocene. We may therefore picture to ourselves groups of cones, similar to those of Auvergne, rising above the forests, then spreading from the rugged Alpine heights of the Western Highlands far away in one mass of green, broken only by the rivers, to Ireland and the remote coast-line of the western sea.

[1] Ramsay, *Physical Geology and Geography of Great Britain*, 3d edit. p 213.

The Rivers.

Since the higher grounds in Great Britain in the Eocene time were in their present positions, it will follow that the watersheds of the principal rivers were then very much as they are now, so far as relates to their upper courses. On the western side of the Pennine mountain axis the Ribble, Mersey, Dee, and Severn fell then, as now, into the Atlantic, after traversing the broad valleys reaching to the line of cliffs off the west of Ireland. Those on the east fell into the south-eastern sea (see Map, Fig. 3), probably joining some of those of Norway, and contributing to form the great river which was the chosen haunt of the alligator and the crocodile, and which flowed through the dense forests of palms and banksias, then covering the Eocene continent in these latitudes. The lower course, however, of the Trent was determined by movements of level, which took place in Post-meiocene times, and the river Thames, as Professor Ramsay has pointed out, came into being also after the close of the Meiocene age.

The Lower Eocene Plants and Animals.

The lower Eocene vegetation[1] in Britain preserved in the London Clay was, as Professor Heer observes, of a tropical and Indo-Australian character. The forests were composed of palms of various sorts (*Palmacites*,

[1] Bowerbank, *Hist. Fossil Fruits and Seeds of London Clay*, 1840. Heer, *Climat et Végétation du Pays Tertiaire*, transl. Gaudin, 4to, p. 172. For a further account of the Lower Eocene flora, the reader may be referred to a forthcoming work by Messrs. Starkie Gardner and Ettingshausen, in the Palæontographical Society's publications.

Flabellaria, Nipadites), the last of which is now represented only by the *Nipa fruticans* of the banks of rivers in India and the Philippines. There were cypresses (*Solenostrobus, Frenelites, Callitritis*) also allied to genera living in Tasmania, and proteaceous plants allied to the banksia, maples, poplars, and mimosas, as well as custard apples, gourds, and melons, and ferns closely related to the living *Osmunda regalis*. This luxuriant and tropical vegetation has been proved by the recent discoveries of Mr. Starkie Gardner, in the Pre-nummulitic deposits at Newhaven, to have flourished in the British area, and not to have been swept down, as was formerly supposed, by a river flowing from a tropical region far away to the south. In the London Clay of Sheppey it is represented mainly by fossil fruits, in the strata at Newhaven principally by leaves which show no sign of having been conveyed long distances by water.

The Lower Eocene Mammalia.

The earliest Eocene mammals[1] found in Britain consist of marsupials and a creature belonging to an extinct family of the odd-toed (Perissodactyle) sub-order of Herbivores. The opossum (*Didelphys Colchesteri*) is to be looked upon as a survival from the Secondary fauna, and the *Hyracotherium*, a small animal with a skull the size of that of a hare, canine teeth resembling those

[1] Owen, *Brit. Foss. Mammals*, and *Palæontology*. Gervais, *Zoologie et Paléontologie Française*, 1859. In determining the principal mammalia in each of the Eocene faunas I have used the works of Owen, Gervais, and Gaudry, as well as a list of the Eocene mammals in the British Museum which has been prepared for me by the kindness of Mr. W. Davies, and my own notes of the species in the Woodwardian Museum at Cambridge. For systematic lists, see Appendix I.

of a peccari, and a form intermediate between that of the hog and the hyrax or coney. Both occur in the Woolwich and Reading series of the Table (p. 16), at Kyson in Suffolk. The *Pliolophus* of the London Clay is closely allied to the latter, while the *Coryphodon* from the same stratum resembled a tapir in its dentition and skeleton.

In the corresponding strata in France two[1] beasts of prey of decided marsupial affinities are met with, the *Arctocyon primævus*, the most ancient of the Tertiary mammals of Europe, allied to the bears in the structure of its teeth, and to the marsupials in the low organisation of its brain, and the *Palæonictis*, with teeth resembling those of the Tasmanian dasyure, and in size rivalling the wolverine or glutton. The latter may very well be taken to be the type from which the family of Civets have been derived. The tapir-like *Coryphodon* also inhabited the lower Eocene land of France, Switzerland, and North America.[2]

These animals constitute a small and insignificant fragment of a fauna, the ancestry of which is to be looked for in the Cretaceous age. They are of peculiar interest, because they show that at this time the carnivores were intermediate in character between the marsupials and the placental mammals.

[1] Gervais, *Zool. et Pal. Franc.* Gaudry, *Les Enchainements du Monde Animal.*

[2] The discoveries made in New Mexico, Wyoming, and Utah, by Professor Marsh and others, prove that the *Coryphodon* was an inhabitant of America, and that the animal was a five-toed tapiroid animal possessed of all the characters of the sub-order *Perissodactyla*. See Marsh, *Amer. Jour. Sc. and Arts*, xiv. July 1877.

The Lower Eocene Birds.

The lower Eocene birds, like the placental mammals identified by Professors Owen[1] and Milne Edwards,[2] belong to extinct genera. In Britain the rivers were haunted by large goose-like birds (*Odontopteryx*) with the beak armed with curious tooth-like processes, by herons, and by kingfishers (*Halcyornis*). There were flights of gulls on the sea, and on the land were to be seen vultures (*Lithornis*) and a great bird (*Dasornis*) resembling in the size of its head the moa of New Zealand. In France the *Gastornis*, of the size of an ostrich,[3] "but more robust and with affinities to wading and aquatic birds," inhabited the banks of the rivers.

The Mid Eocene Flora.

The mid Eocene land in Britain was covered with a rich and luxuriant vegetation[4] like that of the tropics, in which evergreen forest trees abound. The leaf beds of Alum Bay in the Isle of Wight, and of Bournemouth in Hampshire, enable us to form a definite idea of the forests (Fig. 4) which extended from the margin of the Nummulitic sea far away inland, clothing hill and valley with a dense mantle of green. Here cypresses, yews, and pines raised aloft their dark-green foliage; there the screw-pine (*Pandanus*), fan-palms, and feather-

[1] Owen, *Trans. Zool. Soc.*, vii. p. 146. *Palæontology*, p. 291. *Quart. Geol. Journ. Lond.*, xxix. p. 511.

[2] Milne Edwards, *Recherches sur les Oiseaux Fossiles*, 4to.

[3] Owen, *Palæontology*, p. 291.

[4] J. S. Gardner.—"Tropical Forests of Hampshire," *Nature*, xv. pp. 229, 258, 279. Alum Bay: De La Harpe. *Geology of Isle of Wight. Memoirs of the Geological Survey of Great Britain*, pp. 41, 109.

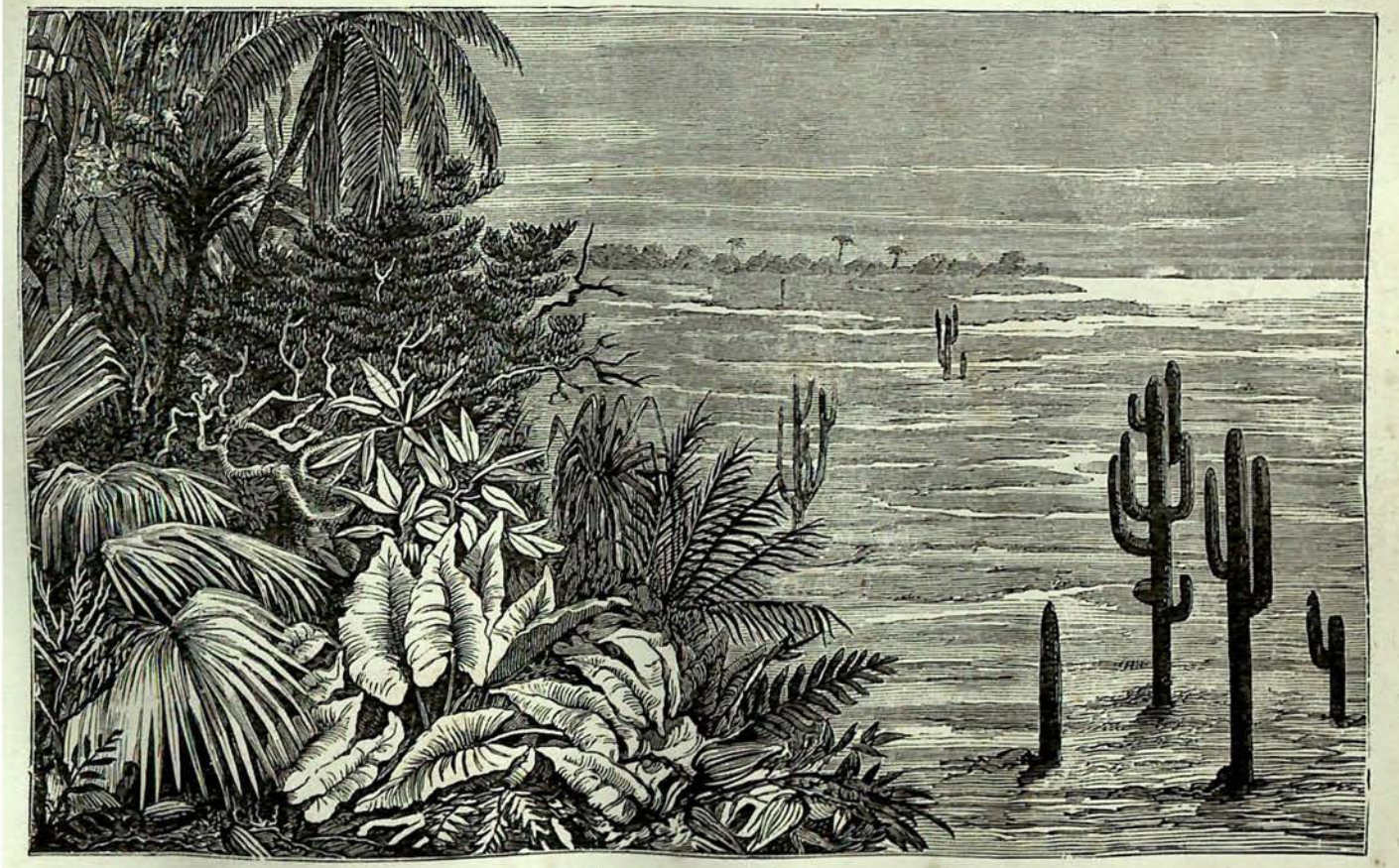


FIG. 4.—Mid Eocene Forest of Bournemouth, overlooking Lagoon.

palms were conspicuous. Gigantic aroids were also to be seen, and various representatives of the family of *Sarsaparilla*. There were groves of poplars, elms, laurels, oaks, hornbeams, beeches, chestnuts, willows, planes, figs, buckthorns, walnuts, maples, spindle-trees, and bread-fruits. The *Celtis* or nettle-tree, several sorts of banksia, and the *Eucalyptus* or gum-tree, may be noted among the remarkable Australian genera presented by the flora. Giant cacti also raised their forms like the huge candelabra that overlook the arid deserts of New Mexico. The tree trunks were garlanded with large creepers belonging to the tropical families of *Porana* and *Bignonia*.

A similar group of vegetation has been identified by Dr. Heer from Monte Bolca in Lombardy, from which it may be inferred that the climate of Europe was more uniform in mid Eocene times than it is at the present day.

The Mid Eocene Mammalia.

These forests afforded shelter and food to a fauna of which very scant traces have been identified. In this country the *Lophiodon* of Bracklesham, an animal resembling the tapir in general appearance, and presenting great variations in size, is the only well-defined mammalian species. In France[1] it is associated with two tapiroid genera (*Pachynolophus*, *Pro-palæotherium*), and animals allied to the hogs and omnivorous carnivores (*Anchilophus*, *Dichobune*, *Heterohyus*). There also were true carnivores of uncertain affinities, one as large as a lion, a second about the size of a badger, and a

[1] Gervais, *Zool. et Pal. Franç.* p. 327. In this view of the French mid Eocene mammalia, I have followed Gervais rather than Gaudry.

third very much smaller, while a fourth was remarkable for its compressed and serrated canines, like those of the *Machairodus*, or sabre-toothed lion haunting the Miocene, Pleiocene, and Pleistocene forests of Europe.

British Upper Eocene Mammals.

At the close of the mid Eocene period there was a general elevation of the continent, in which the southern parts of Britain participated, the coast-line being pushed farther to the south, and the area which had been occupied by the south-eastern sea being covered with the fresh waters of a river. The frequent alternation of marine and fresh water deposits in the Isle of Wight, in Hampshire, and in Sussex, show that those districts were then constantly subject to oscillations of level.

The vegetation covering the southern parts of Britain is imperfectly known, but from the few fragments which are preserved it was, probably, closely allied to that of the mid (Fig. 4) and lower Eocene. In the Isle of Wight the forests were to some extent composed of palms. The mammals, however, present differences of the very highest importance. Instead of the solitary *Lophiodon* which happens to have been found in the deposits of the Nummulitic sea, the remains of a varied mammalian fauna have been discovered in the south of England. Animals (*Palæotherium*) like the tapirs of tropical Asia and America wandered in the forests and on the banks of the rivers (Fig. 5). There were also herds of Anchitheres, which have been proved by the researches of Professors Marsh and Huxley[1] to have

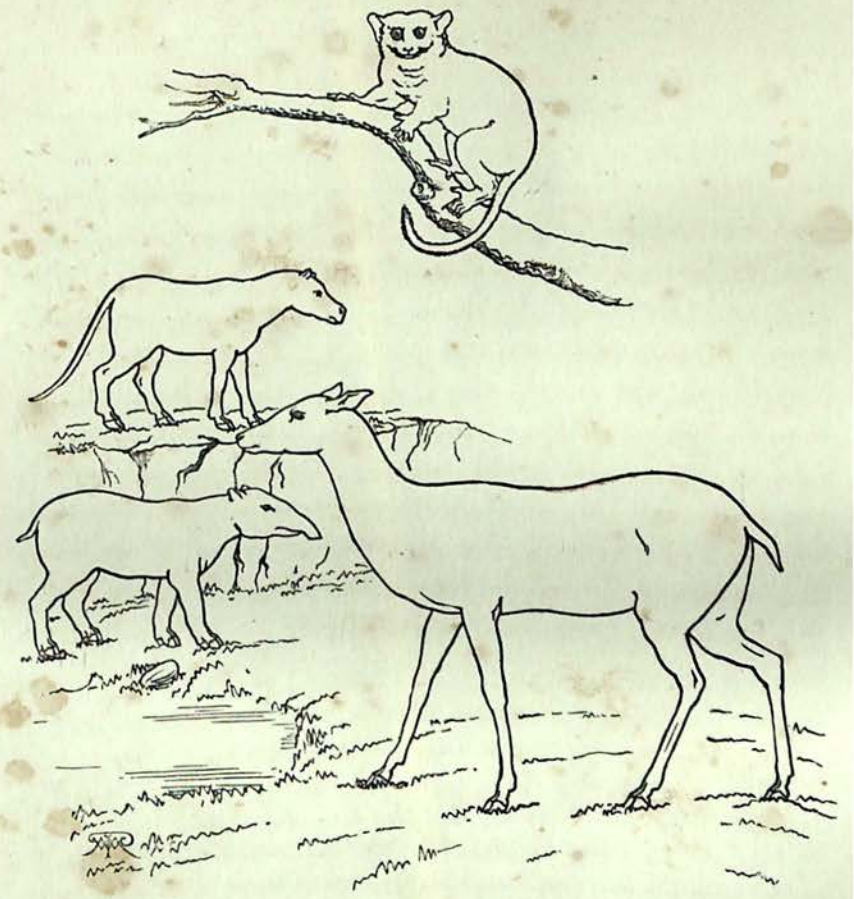
[1] *American Addresses*, Lecture III.

been the ancestors of the horse. They were about the size of Shetland ponies, and possessed three distinct hoofs on each foot, reaching to the ground. The forests also sheltered numerous hog-like animals, such as the *Chœropotamus*, intermediate between the swine and the hippopotamus, and the *Microchœrus* and *Hyopotamus*. Generalised, or rather, as they may with more justice be termed, ancestral forms of the deer and antelopes, hornless and without antlers (*Anoplotherium*, *Dichodon*, *Dichobune*) browsed on the luxuriant herbage in the glades. Overhead on the trees there were opossums, while in the undergrowth lurked the *Theridomys*, a creature allied to the small spiny rats (*Echimys*) of Brazil. There were also beasts of prey, one the *Hyænodon*, or precursor of the hyæna, a carnivore, which to the ordinary characters of a placental mammal united the marsupial attribute of three sectorial molars in each jaw, arranged as in the marsupial *Thylacinus* or Tasmanian wolf, which it rivalled in size.

Upper Eocene Mammalia of the Continent.

The same group of animals lived on the borders of the lake occupying the site of Paris in the upper Eocene times, and the species associated with them enable us to complete our picture. There were small deer-like animals, the Kainothere and the *Amphitragulus*, closely allied in size and form to the musk-deer, as well as the *Xiphodon* (Fig. 5), in elegance rivalling the gazelle. Among the carnivores were creatures resembling wolves (*Cynodon*), foxes (*Amphicyon*), wolverines (*Tylodon*), and hyænas and civets (*Proviverra*), all with characters like the *Hyænodon*, now only found among the Marsupials.

According to Professor Gervais,[1] the opossums were represented in France by no less than eight species.



UPPER EOCENE

Anoplotherium.
Palæotherium.
Lemuroid.
Xiphodon.

FIG. 5.—Upper Eocene Mammalia.

The birds which lived on and around the upper Eocene lake of Paris consist of ten species, among which

[1] *Zool. et Paléont.* p. 334.

some are closely allied to the buzzard, woodcock, quail, pelican, ibis, flamingo, and hornbill of Africa.[1]

The Order Primates represented.

The upper Eocene forests of France were also haunted by representatives of the highest order of mammalia, or the *Primates*, which includes the families of man, the ape, and the lemur. The *Adapis*[2] of the Paris basin classified by Cuvier with the Anoplotheres, has recently been proved to be related to the last of these as well as to the hoofed quadrupeds and insectivores. To the same family also belong the *Necrolemur*,[3] discovered in the south of France, and the *Cænopithecus*[4] of Rütimeyer, found in Switzerland. The family is also proved[5] by Marsh and Cope to have inhabited the forests of North America, during the whole of the Eocene age in New Mexico, Wyoming, in Dakotah and Nebraska. None of these are identical with any living genus of lemur, but all

[1] Milne Edwards, *Oiseaux Fossiles*, ii. 543.

[2] Gervais, *Zool. et Paléontologie Generale*, p. 28 *et seq.* *Journ. de Zool.* i. 476. *Phosphorites de Quercy*, Tarn-et-Garonne-et-Lot.

[3] Filhol, *Journ. de Zool.* ii. 476. Gaudry, *op. cit.* iv. 521. Dell fortrie, *op. cit.* ii. 414. Gaudry, *Les Enchainements*, c. x.

[4] Rütimeyer, *Ueber die Herkunft Unserer Thierwelt*, 4to, 1867, p. 52. The fauna of the Bohnerze, in which the Cænopithecus was found, is considered by Heer to be of Mid Eocene age. It seems to me more probable that it represents also the Upper and Lower divisions. The local deposit of Bohnerze (iron ore) in Switzerland had begun in the Cretaceous age, and may have been continued throughout the Eocene period. The fauna contains characteristic forms of upper as well as Middle Eocene species.

[5] Marsh, *Introduction and Succession of Vertebrate Life in America.* American Association for the Advancement of Science, 1877. Cope, *Hyopsodus.* Report of U.S. Geological Survey of the Territories. Fossil Vertebrates, i. 75.

possess characters bringing them into relation with one or other of the families of hoofed quadrupeds living in the Eocene period (see Fig. 5).[1]

The Climate of Britain Tropical.

The climate of Britain is proved to have been tropical from the time of the London Clay down to the close of the Eocene period by the concurrent testimony of the flora and of the fauna. Just as a high temperature is necessary for the well-being of the feather-palms (see Fig. 4) and large fan-palms, so is it necessary for the full development of the larger forms of reptilian life, such as the alligator, crocodile, and gavial. Among living mammals, the tapir, the inhabitant of the warmer regions of Asia and America, is the closest representative of a large section of the Eocene mammalia, and the lemurs of the present day are only found in hot climates. The nautilus, larger volutes, cowries, and other shells, so common in the Eocene strata, are now only to be met with in the tropical and sub-tropical seas.[2] Mr. Starkie Gardner estimates the mean annual temperature of Britain in the mid Eocene age at 70°, from the examination of the fossil plants.

General Conclusions.

It is impossible for the reader who has followed these three stages of the Eocene period not to be impressed with the extraordinary character of the mammalia. They stand in the same relation to living species that the main

[1] In Fig. 5 I have chosen the Galago as the representative of the Eocene lemurs.

[2] *Nature*, xix. p. 125.

branches of a tree bear to the branchlets and leaves. Only one living genus was then known in Europe, and that is a representative of the marsupial type, which, so far as we know, was universal in Europe in the Secondary period. Marsupial characters, however, are to be met with in the Eocene beasts of prey, which render it very probable that in those times the carnivores were in the act, so to speak, of departing from the type of their marsupial ancestry. On no other hypothesis but that of lineal descent is it possible to account for such characters as their small marsupial brain, their dentition, and numerous details in their skeletons. It would further appear that the lemurs of those times were closely linked to the Ungulata or hoofed quadrupeds.

Man not here.

It is obvious that man had no place in such an assemblage of animals as that described in this chapter. To seek for highly-specialised man in a fauna where no living genus of placental mammal was present would be an idle and hopeless quest. Nevertheless, it is an important fact to note that the lowest member of the order Primates, to which he belongs in natural history classification, was represented in the upper Eocenes of Europe, and throughout the whole of the Eocene period in America.

CHAPTER III.

BIOLOGICAL AND PHYSICAL CHANGES IN BRITAIN BEFORE THE ARRIVAL OF MAN.—THE MEIOCENE PERIOD.

The Meiocene Classification.—Genera of Meiocene Mammalia now living.—The Southern Seaboard.—Continuity with North America.—The Mountains.—Meiocene Volcanoes in British Islands.—The Meiocene Rivers.—The British Meiocene Forests.—Meiocene Flora of the Hebrides and Ireland.—Meiocene Flora on the Continent.—Lower Meiocene Mammals.—Lower Meiocene Birds.—Mammals inhabiting Forests of the Mid Meiocene Age.—Land Mammalia and Birds of Upper Meiocenes.—Meiocene Geography on the Continent.—The Meiocene Climate.—No Evidence of Glacial Period in the Meiocene Age.—No Proof of Man in Europe in the Meiocene Age.

We have, in the course of this chapter, to seek for evidence of man in the Meiocene life period, when the living genera of mammals first begin to appear. It must be admitted that the strict definition of the Meiocene from the Eocene period is one of exceeding difficulty from the imperfect preservation of the fossils, and from the impossibility of ascertaining the exact relative age of assemblies of animals found in isolated lake basins and in river deposits widely remote from each other. The only clue to their geological date is the stage of evolution presented by the mammalia, the more general having obviously preceded in point of time the more special forms.

The Meiocene Classification.

The Meiocene fauna and flora of Britain are but insignificant fragments of those found in the strata occupying a vast area in Europe, south of a line passing through Antwerp, and represented in northern Germany and Denmark by outliers or isolated parts of what were once probably continuous formations. For the purposes of this chapter, the vegetation will be considered in one group, while the mammalia will be treated in three groups—a Lower, Middle, and Upper. It must, however, be remarked that there is less difference between these than between the like divisions of the Eocene described in the last chapter.

The following table represents the Meiocene classification, according to Heer, Gaudry, and Forsyth Major, the two latter using the mammalia as their principal means of determining relative age:—

Table of Meiocene Classification.

	Britain.	Switzerland. (Heer).	France and Germany. (Gaudry).	Italy. (Forsyth Major).
Upper.		Freshwater molasse = Œningian zone.	Léberonian of Mont Léberon. Eppelsheimian of Eppelsheim.	Lignites of Casino, near Sienna.
Middle.		Marine molasse = Helvetian zone.	Simorrian of Simorre. Sansanian of Sansan. Orléanaisian of the Orléanais.	Lignites of Monte Bamboli.
Lower.	Lignites of Bovey Tracey.	Freshwater molasse = Grey molasse zone.	Fauna of the Allier (in part) = Zone of the Calcaire de Beauce.	
	Vegetable accumulation under lava in Hebrides and North of Ireland. The Hempstead beds.	Lower brown coal = Aquitanian zone. Tongrian zone (marine).	Sables de Fontainbleau.	Lignites of Cadibona.

Genera of Meiocene Mammalia now living.

The living genera of land mammalia which appear in Europe in the Meiocene age are represented in the following table, based upon the lists given in Appendix II. In it the reader will see that, with the exception of the insectivores, the squirrels, and the tapirs, no living

genera of placental mammals have been identified in the lower Meiocene, while the opossum, the last representative of the marsupials in Europe, is not found in either of the later stages.

Range of Living Genera in Meiocenes of Europe.

		Lower Meiocene. France.	Mid Meiocene. France.	Upper Meiocene. Middle and S. Europe.
Bat,	*Vespertilio*	—	×	—
Mole,	*Talpa*	×	×	—
Shrew,	*Sorex*	×	—	—
Water-Shrew,	*Myogale*	×	×	—
Dormouse,	*Myoxus*	×	×	—
Hedgehog,	*Erinaceus*	×	×	—
Squirrel,	*Sciurus*	×	×	—
Beaver,	*Castor*	—	×	—
Pika,	*Lagomys*	—	×	—
Porcupine,	*Hystrix*	—	—	×
Cat,	*Felis*	—	—	×
Hyæna,	*Hyæna*	—	×	×
Otter,	*Lutra*	—	×	—
Viverra,	*Viverra*	—	×	—
Mustela,	*Mustela*	—	×	×
Gazelle,	*Gazella*	—	—	×
Giraffe,	*Camelopardalis*	—	—	×
Antelope,	*Antilope*	—	×	×
Deer,	*Cervus*	—	×	×
Hog,	*Sus*	—	×	×
Tapir,	*Tapir*	×	—	×
Rhinoceros,	*Rhinoceros*	—	×	×
Opossum,	*Didelphys*	×	—	—

The Southern Seaboard.

The sea of the Meiocene age touched only one portion of Britain, at Hempstead (Fig. 6), in the Isle of Wight, where strata, 170 feet thick, partly of

marine and partly of freshwater origin, are usually

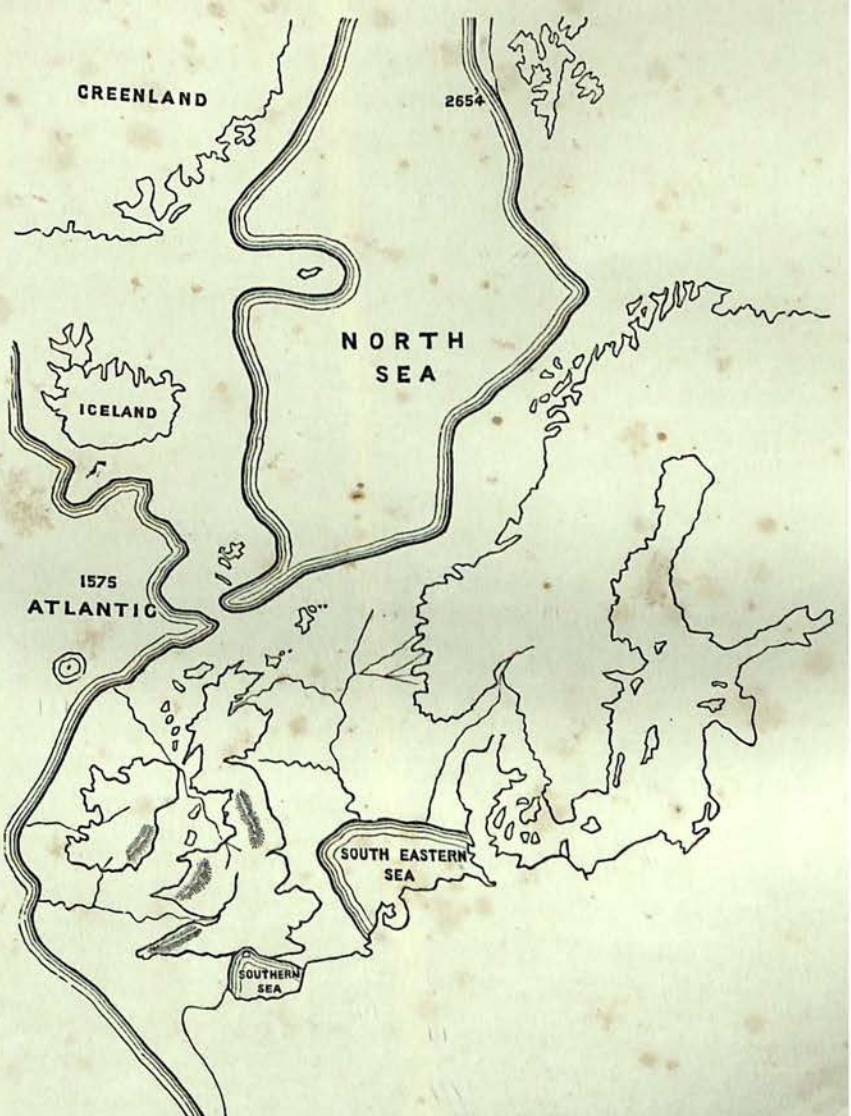


FIG. 6.—Geography of North-Western Europe in the Meiocene Age.

considered to belong to the lower Meiocene division.[1]

[1] Mr. Starkie Gardner believes them to be of upper Eocene age.

They have furnished the remains of a small hoglike animal, *Hyopotamus bovinus* of Owen, which is identified by Professor Gervais with that found in lower Meiocene strata in the Bourbonais. Crocodiles also have been met with, closely resembling those of the lower Meiocene strata of the Boulonnais and valley of the Allier.[1] Among the plants Professor Heer recognises a form analogous to the mammoth tree of California, and three other species identical with those of the lignites of Bovey Tracey.[2]

In the middle and upper Meiocene periods the southern area became lifted up above the waves, and the retreat of the British coast-line southwards towards the mainland of France, which had begun in the Eocene age, was completed by the greater part, if not the whole, of the English Channel becoming dry land.

We may infer, from the rarity of Meiocene deposits in Britain, and from their being, with the above exception, mere freshwater local accumulations, that the mainland of Europe extended northwards, so as to include the British area throughout the middle and later stages of the Meiocene period. The south-eastern sea of the Eocene age (Fig. 3), described in the last chapter, was reduced in the early Meiocene age to two isolated basins, of which one covered the Isle of Wight and the adjacent regions, the southern sea of Fig. 6; while the other extended over Holland and Belgium, but did not come far enough to the west to touch the present coast-line, although its proximity may be inferred from the rolled fragments of Meiocene fossils found in the Pleiocene

[1] *Paléont. Française*, 1859, p. 190.

[2] *Sequoia Couttsiæ, Nelumbium (Nymphœa) doris, Andromeda reticulata, Carpolithes Websteri.*

strata of Norfolk and Suffolk, and derived from the older marine accumulations.

Continuity with North America.

The researches of Professor Heer into the fossil vegetation of the Continent, Britain, Iceland, Spitzbergen, Greenland, and Grinnell-land, prove that the whole of this portion of the earth's surface was dry land in the early Tertiary period, offering free means of migration to plants and animals from the Polar regions into America on the one hand, and Europe on the other. Among the forms common to the Meiocenes of Europe and the flora of the American continent, we may notice the mammoth tree, magnolia, tulip tree, red wood, and swamp cypress (*Taxodium disticum*); among the mammalia common to both, the *Hipparion;* among the reptilia, the alligator-tortoise[1] and a frog,[2] allied to the horned species of Brazil. Similar evidence of direct communication between the two continents is afforded by the Meiocene insects[3] and land crabs (*Gecarcinus*) of Oeningen, in Switzerland. We may therefore conclude that the barrier of land connecting the British area with Iceland and Greenland in the Eocene, existed in the Meiocene age, and allowed plants which were Eocene in the Polar regions to flourish in Meiocene Europe. The five-hundred fathom line indicates the probable coast-line

[1] *Chelydra Murchisoni*, Bell. The representative species inhabits the rivers and lakes of the United States, from New York to Florida, and is a rapacious animal, living on fishes, amphibia, and young birds.

[2] *Latonia Seyfriedi*, Meyer. According to Heer, allied to *Ceratophrys cornuta*.

[3] The genus *Naupactus* and others. See Heer, *Primeval World of Switzerland*, ii. c. i.

during both ages, and the rapid increase of depth in the Atlantic to its west would allow of a considerable depression taking place, without altering in any important degree the position of the sea-margin..

Professor Heer[1] places his Atlantis to the south-west of the land represented in the map (Fig. 6); but the enormous depth of the North Atlantic renders it very improbable that there was dry land in that region at a time, geologically speaking, so recent as the Meiocene age.

The Mountains.

The principal mountains in the British Isles were in their present positions in the Meiocene age, but were considerably higher. If we take the rate of denudation to be the same as that which we know to have taken place in the volcano of Mull in post-Meiocene times (Fig. 7), which, exclusive of the cone, has been shown by Professor Judd[2] to have been 6000 feet high, while the present height of Beinn More, the highest fragment now remaining, is but 3172 feet, we arrive at the startling result that the height of the Meiocene mountains in Britain was double what it is now. It is therefore probable that in the western and northern parts of our island mountains rose to a height of 6000 or 7000 feet, even if we do not take into account the amount of elevation above the sea necessary to allow of continuity between Britain and Iceland. If the 500 fathoms of elevation of the Meiocene continent be added, the mountains must then have

[1] *Climat et la Végétation du Pays Tertiaire*, transl. Gaudin; 4to. See also Lyell, *Student's Elements*, 1865, c. xvi.

[2] *Quart. Jour. Geol. Soc. Lond.* xxx. p. 259.

lifted up their heads in Wales, Cumbria, and Scotland not less than about 10,000 feet above the sea.

Volcanoes in British Islands.

The fossil vegetation under the sheets of basalt and of volcanic tufa in the Hebrides and in the north of Ireland, proves that in the north and west of the British Isles there were active volcanoes in the Meiocene age. Some of these were of enormous size. "The base of the volcano of Mull"[1] (Fig. 7), writes Professor Judd, "must have had a circumference of at least forty miles; Etna, which has a greatly truncated cone, nevertheless rises to over the height of 10,900 feet from a base of only thirty miles in circumference. A similar relation between the base and

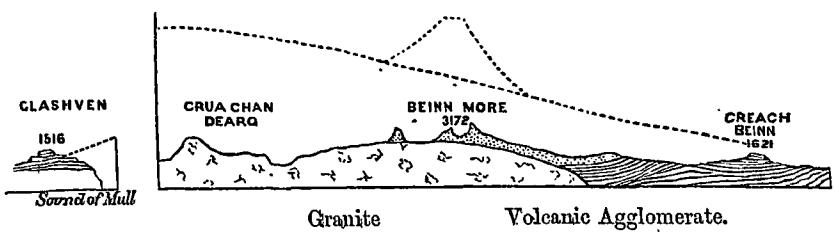


FIG. 7.—Section through Beinn More. The dotted line = Meiocene Surface.

the altitude of the great volcanoes of Sicily and Mull would lead us to infer that the elevation of the latter was at least 14,500 feet." From another calculation, founded on the inclination of the beds of lava, he infers that the volcano of Mull could not have been less than 10,000 feet high. The volcano of Skye was not smaller than that of Mull, and those of Rum, Ardnamurchan, and St. Kilda, though smaller, were mountains of great

[1] Fig. 7 is taken from Professor Judd's Section, *Quart. Jour. Geol. Soc. Lond.* xxx. p. 259, Pl. xxiii.

extent and elevation. The granites of Arran, and, in Ireland, those of the Mourne mountains and the basalts of Antrim, are also referred to the same age. Thus, in the Meiocene age, along a line of 400 miles from north to south in the British area, there rose a chain of lofty and active volcanoes, on a scale comparable to those of the Andes, overwhelming from time to time with their lava and ashes the Meiocene forests in their vicinity. This line of ancient volcanoes is continued northwards into the Färoes, Iceland, and Greenland.

Denudation since the Meiocene Age.

The present state of these volcanoes affords us a means of measuring the destruction of rock in the post Meiocene times. In Fig. 7 the dotted line represents the outline of the Meiocene surface, while the actual surface is shown by the continuous line. Not only have their cones disappeared by the action of the elements, but the more solid accumulations forming their bases have been reduced to mere fragments during the untold ages which have passed away since they were active. Since they have lost more than one half of their former height, it is reasonable to suppose that similar amounts of rock have been removed from other areas in Great Britain, the greatest destruction being wrought on the flanks of the mountains, and the least on the slopes near the sea level. Under these circumstances, we could not expect that any traces of the old Meiocene land surface or river deposits should be preserved to the present day, excepting under very unusual conditions. They for the most part have been swept away, along with a flora and fauna probably

as rich as that of the continent, leaving behind a few fragments preserved from destruction by the great original thickness of the deposit, or by its having been covered up by showers of ashes and streams of lava from the Meiocene volcanoes.

The Meiocene Rivers.

The rivers of Britain in the Meiocene age (Fig. 6) were probably in the position which they now occupy, although they flowed at a higher level—the only difference being that their lower courses were prolonged to the coast-line of the period. The Severn, for example, and the Dee, Mersey, and Ribble, would debouche into the Atlantic after traversing the lower grounds now submerged. The Trent and Humber, in like manner, would find their way into the south-eastern sea.[1] Some of the Irish lakes also—such as Lough Neagh—were lakes then. In Devonshire the small lake of Bovey reflected on its still surface the luxuriant forests by which it was surrounded.

The British Meiocene Forests.

The Meiocene forests of Britain, preserved in the deposits of ancient lakes, or buried under volcanic ashes and lavas, occur merely in a few isolated spots in Devonshire, the Scotch isles, and in Ireland.

The lignites of Bovey Tracey,[2] to the south-east of

[1] Ramsay (*Physical Geology and Geography of Great Britain*, p. 217, *et seq.*) believes that the lower part of the valley of the Severn and the whole of the Thames valley are post-Meiocene.

[2] *The Lignites of Bovey Tracey*, by William Pengelly, F.R.S., and Dr. Heer. *Phil. Trans.* 1862. 4to, 1863, p. 18.

Dartmoor, and their associated sands and clays, were formed in a lake at least fifty fathoms deep, and spread over an area of about twenty-four square miles, fed by the rivers Teign and Bovey, which did not then unite as they do now. In other respects, the leading features of the district were then nearly as they are now, and the heights of Dartmoor and the neighbouring hills commanded the lake very much as they stand at present over the plains of Bovey. The woods then growing on the sides of the lake and on the banks of the rivers were to a large extent composed of a huge conifer (*Sequoia Couttsiæ*), analogous to the mammoth tree (*Sequoia* (*Wellingtonia*) *gigantea*) of California, and in general appearance identical; its leaves, however, were shorter, and its cones smaller. Cinnamon trees (*Cinnamomum lanceolatum and C. Scheuchzeri*) were abundant, and an evergreen oak (*Quercus Lyelli*), somewhat like those now living in Mexico. There were evergreen figs also, and custard apples (*Anona*), and a species belonging to the genus *Gardenia*. Vines leapt from tree to tree, and the prickly rattan-palm (*Palmacites dæmonorops*) was to be seen among the dark green foliage of the *Dryandroides*, which calls to mind the banksias of Australia. Gum trees were also there; and the spindle trees, now found in the warmer regions of Europe, North America, Asia, and Africa, are represented by a species of *Celastrus*. In the shade throve numerous ferns, one of which (*Pecopteris lignitum*) seems to have formed "trees of imposing grandeur," and the undergrowth was largely composed of various species of the North American genus *Nyssa*. On the margin of the lake clusters of water-lilies raised their beautiful blossoms and dark-green leaves, shedding

the highly-ornamented seeds which lie buried in the sand and mud formed by the water.

This flora is identified by Professor Heer with that of the lower Meiocenes of France and Switzerland.

Meiocene Flora of the Hebrides and Ireland.

A flora similar to that of Bovey Tracey occurs in the island of Mull under lava and volcanic ash, consisting of the red wood (*Sequoia Langsdorfii*), hazel (*Corylus grossidentatus*), plane, and several other trees. It is also met with in the lignites under the basalts of Antrim. A fir tree (*Pinus Plutonis*) closely allied to the cluster pine, a cypress, and a gum tree have been identified from this deposit by Mr. Baily, and some of the leaves strongly resemble the buckthorn, beech, and an evergreen oak. In another place in Ireland, near Shane's Castle, Lough Neagh, the ash-beds have yielded the red wood and a species of plane (*Platanus aceroides*).[1]

Meiocene Flora on the Continent.

The vegetation hitherto recorded in the British Isles is but an insignificant fragment of the extraordinary flora revealed by the labours of Professor Heer and others on the mainland of Europe. The Meiocene forests of France, Germany, Switzerland, and Italy comprised forms now met with only in widely remote parts of the earth, and are of singular interest because of their testimony, not merely as to climate, but also to a closer geogra-

[1] *Quart. Journ. Geol. Soc. Lond.* (1853), vii. 103; (1869), xxv. 357; (1870), xxvi. 162.

phical relation between Europe, Asia, and America in the Meiocene age than at the present time.

The number of European species is estimated by Professor Heer at about 3000, of which 920 have been collected in Switzerland. The cycads, so abundant in the Secondary period, are represented by two species, while of the cypresses one (*Glyptostrobus*) is to be met with in Eastern Asia; another (*Taxodium distichum*), found in the fossil state in Spitzbergen, Alaska, and Italy, is that which gives its name to the cypress swamps of the Southern States and of South America. The *Libocedrus* is now only to be found in California, Chili, and Australia, and the *Widdringtonia* in South Africa and Madagascar, all being exotic and tropical or sub-tropical. The mammoth tree and red wood tree of California lived in the Meiocene forests from the Mediterranean to the Arctic circle. In Switzerland a Puya, like that of Chili, represents the exotic pine-apple family, and a large-leaved ginger contributed greatly to the tropical character of the foliage.

The Meiocene palms were represented in the Swiss forests by at least eleven species, which may be grouped into fan-palms (see Fig. 8), with the leaflets all diverging from the tip of the leaf-stalks, and the feather-palms, in which they spring right and left from the foot-stalk. To the former belong the dwarf fan-palm, the *Sabal major*, which then lived in central Italy and northern Germany as far as 51° N., bearing a strong resemblance to the shadow-palm of the West Indies. A second agrees with the swamp palmetto of the Southern States in its small leaves, while the leaves of a third are estimated by Professor Heer to have been no less than six or seven feet broad; they sprang from a lofty trunk, and

must have formed a prominent feature in the landscape. Of the feather-palms the *Phoenicites* may be compared to the Piassava of Brazil, and had leaves two feet long, while the *Manicaria* possessed great undivided erect leaves springing from a lofty trunk.

The Meiocene poplars of Switzerland belong to the group of aspens, black poplars, balsam poplars, and leather poplars, with evergreen leaves, the first two of which are met with in Europe, Asia, and America, the third in America and Asia, while the fourth is now only found in Asia. The hornbeam and the hazel were present, and of the oak no less than thirty-five species have been determined, for the most part evergreens of American or Mediterranean types. There were also lindens, maples, hollies, walnuts, ilices, cherry, plum, and almond trees, mimosas and acacias, alders, birches, and other trees familiar to our eyes. The genus *Planera* is the most interesting Meiocene representative of the elm family, since it ranges from central Italy as far as Greenland, and from the canton of Vaud in the west to Tokay, in Hungary, on the east. It probably formed woods on the low damp grounds close to the rivers. At the present time it is found in Crete, in Asia, south of the Caucasus, and in North America. Myrtles formed dense copses, for the most part evergreen; and the fig trees, represented by seventeen species in the Swiss Meiocenes, belong to Indian and American types, one of which is remarkably like the Indiarubber tree (*Ficus elastica*), and another like the bread-fruit. It is a curious fact that the present European fig-tree (*Ficus carica*) is absent from this flora. The laurels were more abundant than the figs in Switzerland, the two most important species being the camphor tree and Scheuchzer's cinnamon tree. These range

throughout the Meiocene strata, and are found fossil in Italy, Germany, France, and Britain. The former is a native of southern Asia, but it thrives also in Sicily and Madeira, while the latter resembles a Japanese laurel.

The camphors, cinnamons, and laurels were large evergreen forest trees; the sassafras was probably a shrub or small tree. A species of sandal-wood tree, belonging to a well-marked Australian genus, *Leptomaria*, and the Australian Proteaceous genera, *Hakea*, *Dryandra*, *Banksia*, and *Grevillia*, have also been met with. Of the climbers, the convolvulus family is represented by the Indian genus *Porana*, while *Bignonias*, now found only in the sub-tropical and torrid zones, wound round the trees. There were also small-leaved ivies, and vines allied to the American fox-grape; and among the climbing plants several species of Sarsaparilla. Magnolias, tulip trees, and planes ranged in the Meiocene age from Italy to Iceland, and the gum tree from Italy to Britain.

The general conclusions drawn by Professor Heer as to the Swiss Meiocene species are as follows:—"Of the species most nearly resembling the Swiss Meiocene species, 83 live in the northern United States and 103 in the southern United States, 40 in tropical America, 6 in Chili, 58 in central Europe, 79 in the Mediterranean zone, 23 in the temperate, 45 in the warm, and 40 in the torrid zone of Asia, 25 in the Atlantic islands, 26 in Africa, and 21 in Australia.

"These numbers show that in the Meiocene period Switzerland was inhabited by types of plants which are now scattered over all parts of the world, but that most of them correspond to American species. Europe only stands in the second rank, Asia in the third, Africa in the fourth, and Australia in the fifth. Most of

the analogous species of Europe are found in the Mediterranean countries, in America, in the southern United States (Louisiana, Florida, Georgia, and Carolina), and also in California, in the Caucasian region of Asia, in Japan, in Asia Minor, in Madeira, and the Canary Islands. Swiss Meiocene species are also represented in the torrid zone of Asia, in the Sunda Islands, and in tropical America.

"When the mass of vegetation is considered, which was the special characteristic of Switzerland in Meiocene times, greatly increased prominence is given to the Japanese types by the abundance of camphor trees and *Glyptostrobi*; to the Atlantic element by the laurels; to the American types by the numerous evergreen oaks, maples, poplars, planes, liquidambars, *Robiniæ*, *Sequoiæ*, *Taxodia*, and ternate-leaved pines; and to the types of Asia Minor by the *Planeræ* and a species of poplar (*Populus mutabilis*). The greatest number and the most important of the types of the Swiss Meiocene flora belong, therefore, to a belt lying between the isothermal lines of 59° and 77° Fahr. (15° to 25° Cent.), and in this zone America is now the region mostly correspondent to the natural character of the Swiss Meiocene land."[1]

Lower Meiocene Mammals.

The mammals inhabiting the Meiocene forests of Europe must be considered in three divisions, as they appeared successively in time. The first group of mammals presents, as may be expected, an assemblage of forms, some of which are new, while others

[1] Heer's *Primeval World of Switzerland*. Transl. Heywood, vol. i. pp. 370, 371.

are survivals from the upper Eocene. Among the latter are the *Xiphodon* and *Kainothere*, the *Anchithere* and the *Paloplothere*, as well as the Opossum and carnivorous *Hyænodon*. The two animals most characteristic of this stage are the hog-like *Hyopotamus*, and the remarkable creature the *Anthracotherium*, possessing back teeth like the hog, but front teeth (premolars, canines, and incisors) as well adapted for piercing and dividing flesh as in any of the true carnivores. The living genera were represented by the following animals. Rhinoceroses of small size, some without horns, and tapirs, lived in the forests; there were squirrels and dormice, hedgehogs, shrews, musk-shrews, together with beasts of prey belonging to the genera *Mustela* and *Viverra*. There were also moles burrowing in the ground. There were no true hogs nor representatives of the family of elephants, and among a large and varied group of animals representing the deer and the antelope there were none bearing antlers or horns.

The most important fact to be remarked in the mammalia of Europe at this period is that the opossums were still lingering in the forests, and that the marsupial ancestry of the Carnivores still asserted itself in the singular combination of characters offered by the *Hyænodon*. Here we bid farewell to the European marsupials, and none of their characters have been observed in any placental mammal living in the Old World in any subsequent age.[1]

Lower Meiocene Birds.

We are indebted to Professor A. Milne-Edwards[2] for

[1] For details of lower Meiocene Species see Appendix II. A.

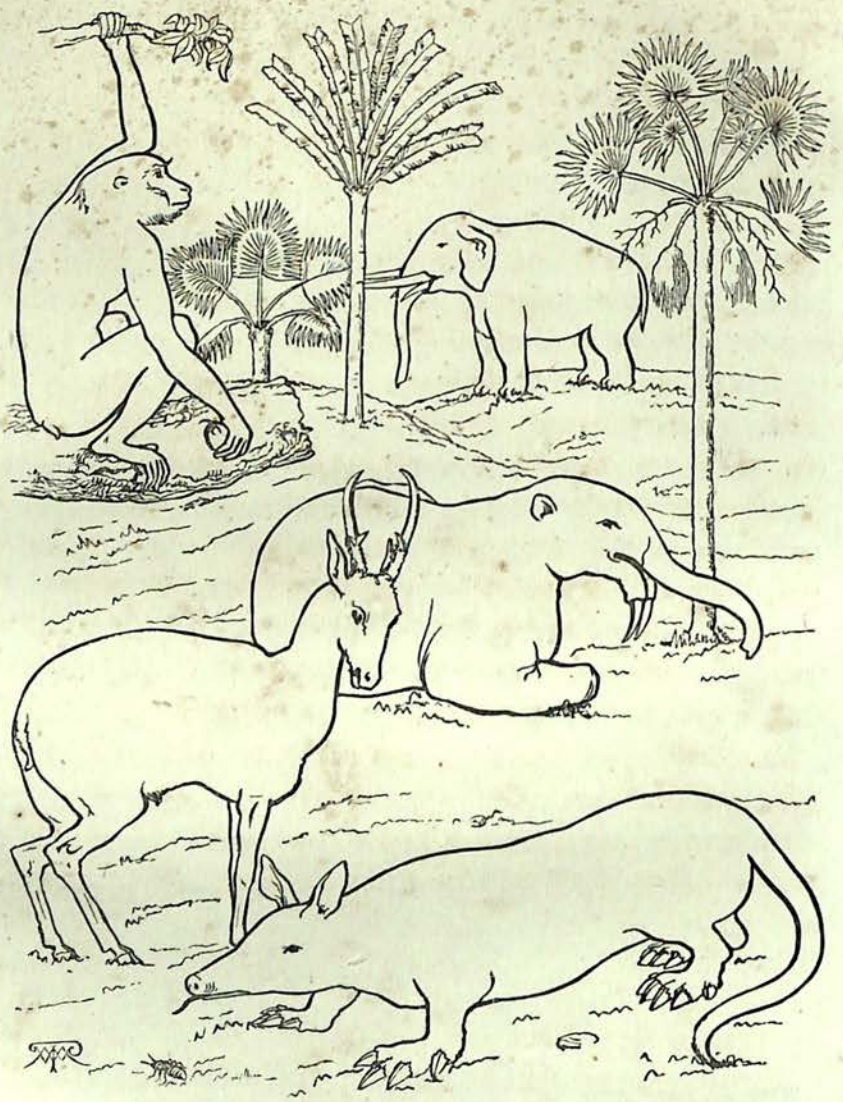
[2] *Oiseaux Fossiles*, 4to.

an admirable account of the birds inhabiting the shores of the lower Meiocene lake in the district of the Allier at St. Gerand-le-Puy, Varennes, and other localities. He has described sixty-six species belonging to groups, some of which are no longer found in the region north of the Mediterranean. Parroquets and trogons inhabited the woods; birds-nest-swifts built their nests in hollows of the rocks, after the fashion of those which one finds at the present time in the Indian Archipelago; a secretary bird, closely allied to that of the Cape of Good Hope, hunted in the plains the serpents and reptiles which then, as now, must have formed its usual food; and eagles swooped down on their prey. Large marabouts, cranes, flamingoes, and strange extinct birds, *Palælodus*, allied to the flamingoes and the ordinary waders and ibises, haunted the borders of the streams. Pelicans floated in the lakes, while sand-grouse and numerous gallinaceous birds contributed to give to this ornithological fauna a most striking character, which reminds us of those pictures which Livingstone has put before us of lakes in southern Africa. The greater part of these birds appear to have nested in the Allier, if they did not inhabit the district throughout the whole year.

Mid Meiocene Mammalia.

The remains of the animals found at Sansan and Simorre[1] in the south of France, may be taken to represent the mammalia of Europe in the middle stage of the Meiocene period. The following new genera make their appearance. A hog with small canines found his living in the forests, and deer and antelopes, remarkable for

[1] See Appendix II. B.



Sabal major (Ung.)

Manicaria formosa (Heer).

Flabellaria Ruminiana (Heer).

Ape.
Deer.

Mastodon.
Deinotherium.
Edentate.

FIG. 8.—Mid Meiocene Mammalia.

their antlers and horns being very small, were to be seen in the plains. One species of deer (*Dicroceros elegans*) was closely allied to the Muntjak[1] (Fig. 8)[2] of eastern Asia, and in some others the antlers were persistent throughout life. In the rivers beavers made their dams, and otters pursued their finny prey. Among the more important extinct genera (Fig. 8) then living, were two large animals resembling in habits and general appearance the elephants. One, the *Deinotherium*, was remarkable for two large tusks curving downwards in the lower jaw; while the other, the *Mastodon*, possessed tusks in both upper and lower jaws, and teeth of a much coarser pattern than those of the elephants. Rhinoceroses also, one with a very feeble horn, and the other hornless, fed on the luxuriant vegetation; and an extinct kind of gigantic ant-eater, *Macrotherium*, allied to the *Orycteropus* of southern Africa (Fig. 8), dug into the ant-hills with his powerful claws, and preyed upon the *Termites*. We meet also with *Anchitheres* for the last time. These herbivores were kept in check by numerous carnivores, of which the most important was the great sabre-toothed lion, *Machairodus*.

Apes in the Mid Meiocene Forests.

The most important animals to be noted in the mid Eocene forests of France, Switzerland, Germany, and Italy, are certain large apes, identified by Dr. Rütimeyer with the genus *Hylobates*, one of the more highly

[1] *Procervulus Aurelianensis*, Gaudry (*Les Enchainements*, 87, from Thenay (Loir-et-Cher). The antlers are without a burr.

[2] The Gibbon, the Muntjak, and the Orycteropus are taken to represent the apes, the deer, and the edentates in Fig. 8.

developed of the *Quadrumana*. It is considered, however, by Professor Gervais[1] and Dr. Forsyth Major to indicate an extinct genus, *Pliopithecus*, allied to the anthropoid apes, and differing in the form and proportions of its teeth from that of the true Gibbons.

In Fig. 8 the latter animal is taken to indicate the probable appearance of the fossil. A second ape, *Dryopithecus Fontani*,[2] found in association with oak-trunks at Saint Gaudens, Haute Garonne, is considered by Prof. Lartet to be one of the anthropoid apes, rivalling man in size, and by Prof. Owen[3] to be allied to the *Pliopithecus* and living gibbons. A third ape, found at Steinheim in Wurtemberg, is described by Prof. Fraas[4] as a species of *Colobus* (*C. grandævus*); while a fourth, *Oreopithecus*, found in the lignites of Monte Bamboli, is stated by Prof. Gervais[5] to be allied to the anthropoid apes, the macaques and the baboons.

Mid Meiocene Birds.

The mid Meiocene birds identified by Prof. Milne-

[1] Lartet, *Notice sur la Colline de Sansan*, Auch, 1851. Gervais, *Zool. et Pal. Francaises*, p. 8. See Forsyth Major, *Actes de la Société Italienne des Sc. Nat.* xv. 1872. Rütimeyer, quoted by Heer, *Le Monde Primatif en Suisse.*

[2] Lartet, *Comptes Rendus*, xliii. 1856. The late development of the wisdom tooth or last molar, considered by Professor Lartet to be a character common to this animal and man, is also met with, as Dr. Forsyth Major observes, in the *Macacus rhesus*. It has not, therefore, the importance which is attached to it both by Professor Lartet and Sir Charles Lyell (*Student's Elements*, p. 196). See also Professor Gaudry's interesting analysis of the characters of this jaw, *Sur les Enchaînements*, p. 237 *et seq.*

[3] Owen, *Proceed. Zool. Lond.* xxvi. 1859, p. 18.

[4] Fraas, *Die Fauna von Steinheim Wurtemberg Naturw. Jahreshefte*, xxvi. 1870, p. 145.

[5] *Zool. et Pal.* 2d ser. 4to, p. 9.

Edwards belong principally to living families, but do not present us with any living species. There is a parroquet more slender than that of the Allier, and large gallinaceous birds about the size of peacocks frequented the borders of the lakes. The shores of the sea in which the marine *faluns* of the Loire were deposited, were inhabited by cormorants, geese, herons, and pheasants.[1]

Land Mammalia and Birds of Upper Meiocenes.

The third well-marked invasion of Meiocene Europe by the mammalia is that represented by the remains found in Germany at Eppelsheim, in Hungary at Baltavar, in France at Mont Léberon, in Spain at Concud, and in Greece at Pikermi. Numerous antelopes and two closely allied species of gazelle spread in vast troops over the plains of Hungary, Spain, Southern France, and the shores of the Mediterranean. A large wild hog with small canines, and two sorts of rhinoceros, horned and hornless, a tapir, gigantic elephant-like creatures, the *Deinotherium*, and the *Mastodon*, roamed through the forests and bathed in the rivers, and fell a prey to the great sabre-toothed feline *Machairodus*. All these genera, it will be remembered, lived also in the forests of the mid Meiocene age in France, Switzerland, and Italy. Great herds of *Hipparions*, animals resembling small asses or quaggas, intermediate in structure between the *Anchithere* and the horse, wandered over the whole of Europe, the greater part of Asia and of North America. A small deer with bifurcating antlers, resembling the Muntjak of tropical Asia, ranged over France and Germany, while

[1] *Ann. des. Sc. Nat.* 5e sér. *Zool. et Paléont.* lxvi. p. 1.

a second, with small upright antlers of a shape unlike any living species (Fig. 9), flourished in France and probably also in Spain.

The plains of Pikermi, then stretching southwards from the rocky mountains of Attica far into the area now covered by the Mediterranean, supported countless troops of antelopes, varying in size and form, and, for the most part, allied to those of Africa; one, the *Helladotherium*, was of large size and allied to the giraffe; this last animal was also present. Numerous apes (*Mesopithecus*) inhabited the woods, intermediate in character between the *Semnopithecus* on the one hand, and the *Macacus* or Barbary ape on the other, being related to the one in the form of its head, and to the other in the length of its limbs. A large ape also has been met with at Eppelsheim. Thus in the upper Meiocene age the range of the *Quadrumana* extended from the shores of the Mediterranean, at least as far to the north as 49° 43′ north latitude, or 14° farther north beyond the present northern limit of the old world apes.

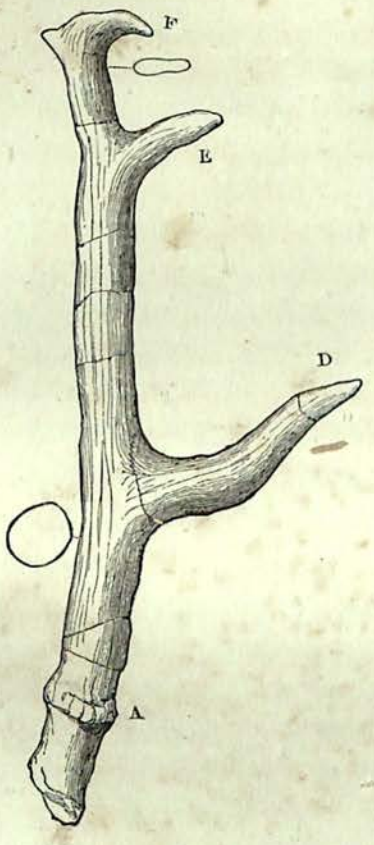


FIG. 9.—*Cervus Matheroni*, Gervais, Mont Léberon, ⅓.

The *Edentata* (sloths, ant-eaters, etc.) also were repre-

sented by two forms which survived from the middle Meiocenes, lived in France and Germany; the *Macrotherium*, or gigantic ant-eater; and the *Ancylotherium*, allied to the rhinoceros and mastodon as well as to the *Pangolins* of Asia and Africa. Like the living *Pangolin*, the latter probably fed upon insects, and more especially ants and termites, which Professor Heer has shown to have abounded in Meiocene Switzerland.

Three kinds of birds inhabited the Mediterranean district in the neighbourhood of Attica, a pheasant (*Phasianus Archaici*) larger than the common species, a small fowl (*Gallus æsculapii*), and a wader (*Grus Pentelici*).

Meiocene Geography on the Continent.

Great geographical changes took place in the Meiocene age on the continent of Europe. In the lower Meiocene large tracts of land were submerged in France, Belgium, and Italy. Then followed a period of elevation above the sea-level, during which there were great lakes in Auvergne and Switzerland, in which the lower freshwater "molasse" were deposited. Then followed a second period of depression below the sea-level, which reduced the continent to the condition of an archipelago. The waters of the Mediterranean flowed northwards past Berne to join the sea, then covering the basin of the Danube. This mid Meiocene sea afterwards gradually became shallower, and the freshwater lakes of the lower Meiocene are again repeated in Switzerland and in France in the upper Meiocene age.

Auvergne was one of the centres of volcanic activity, and the Meiocene lakes were frequently invaded by

streams of lava and clouds of ashes. In Switzerland also the formation of great lakes of upper Meiocene age was accompanied by the development of volcanoes, at Oeningen.[1]

The central axis of the Alpine chain occupied its present position, and may have been as high or higher than it now is. The denudation, by which it has suffered in the long lapse of ages since the Meiocene times, has been compensated by the amount of elevation by which the Meiocene strata of the Tongrian zone have been lifted up no less than 10,940 feet above the sea in the Dent du Midi. Those of the Helvetian zone have been elevated 2470 feet at Lausanne, and 2800 at Berne.[2]

The same remarks apply also to the Pyrenees, although their history has not been made out with the same accuracy as that of the Alpine chain.

The Meiocene Climate.

The testimony as to climate offered by the Meiocene vegetation is clear and decisive. The numerous palms could only have flourished under a warm and equable climate, and the flora as a whole is now only to be found in sub-tropical regions, where the winters are very mild. In the vast lapse of time, however, represented by the Meiocene strata in Switzerland, a gradual lowering of temperature is marked by changes in the vegetation. In the lower Meiocene, or Aquitanian stage, evergreen trees and shrubs constitute nearly three-quarters of the whole forest, while in the upper Meiocene

[1] Heer, *Primeval World of Switzerland*, i. p. 303.

[2] Heer, *op. cit.*

they divide the flora with the deciduous trees. Palms, fig-trees, and fine-leaved acacias abound in the lower, while in the upper strata they are to a great extent replaced by maples and poplars. The palms are found throughout, but are more rare in the upper strata. The greatest change, as we might expect, occurs at the time when the sea rolled over part of Switzerland in the middle, or Helvetian stage.

The elaborate investigations of Professor Heer show that the climate of middle Europe was in the lower Meiocene stage similar to that now prevailing in Louisiana, the Canaries, North Africa, and South China, with a mean annual temperature of from 68° to 69·8° Fahr.; while that of the Upper Meiocenes resembled that of Madeira, Malaga, Southern Sicily, Southern Japan, and New Georgia, with a mean annual temperature of 64·4°, 66·2° Fahr.

While the climate was warm in the region south of the Baltic, it was temperate in Iceland, where the flora consists of species capable of living under temperate conditions. The same remark holds good with regard to the Meiocene plants of Spitzbergen, in which we do not find any tree or shrub with evergreen foliage. It also holds good for that of the western coast of North Greenland, in 70° north latitude, where magnolias, chestnuts, oaks, planes, and vines, indicate "a climate analogous to that now characteristic of the lake of Geneva."

These conclusions as to the nature of the climate[1] in

[1] Heer, *Primeval World of Switzerland*, ii. 147. We must note that the Polar vegetation taken by Heer to be Meiocene is considered by Dawson and Starkie Gardner, Eocene. This question is discussed in the second chapter of this work.

Meiocene Europe are confirmed by the distribution of animal life. Among the insects of Switzerland we find the white ants, or termites, now peculiar to hot countries, dragonflies of South African type, land crabs, also peculiar to the tropics, and among the mollusca inhabiting the rivers and lakes, the exotic genus *Melania*. The insect fauna, however, of Oeningen contains very many forms now living in Switzerland and in southern Europe, and is, on the whole, as Professor Heer observes, more of Mediterranean than of tropical and American stamp.

The amphibians and the reptiles belong to genera now widely scattered, and some peculiar to warm countries. The gigantic Meiocene salamander (*Andrias Scheuchzeri*), four feet long, is allied to those of southern Japan and America; a gigantic frog is closely allied to the horned frog of Brazil; a crocodile to that now found in the Nile; an alligator-tortoise, about three feet long, to that of the genus now abundant in the warm rivers of the Southern States; and a river tortoise (*Emys*) to those of the rivers of India and Africa.

The secretary birds, ibises, flamingoes, parroquets, and marabouts present us with an assemblage of birds now found only in warm regions; while the giraffes, antelopes, deer, and rhinoceroses of middle and southern Europe are forms analogous to those now restricted to tropical Africa and southern Asia. Monkeys of various sorts extended from the Mediterranean as far north as Eppelsheim, and fed upon the figs and bread-fruits, walnuts, almonds, dates, rice, and millet, as well as on the acorns, then growing in those regions.

No Evidence of a Glacial Period in the Meiocene Age.

It is believed by some authorities[1] that during the long ages of the Meiocene period there was a glacial climate in Europe, "as severe as, if not more excessive than, the intensest severity of climate experienced during the last glacial epoch;" or, in other words, that there was as great a lowering of the temperature as that by which great tracts of land were covered with ice and snow in the Pleistocene age. This conclusion is founded upon the discovery of angular blocks of stone in the upper Meiocene strata of the Superga Hill, near Turin, which have been conveyed some twenty miles away from the Alpine localities in which similar rocks are seen *in situ*. They are angular and indistinguishable from the erratic blocks of the district, and are believed by Sir Charles Lyell and Professor Gastaldi to have been transported to their present positions by ice.[2] It seems to me that these blocks do not prove a severe climate in any place except where the ice in question has been produced, which may have been on the tops of lofty mountains, like those of the Andes, which send glaciers down to the sea in Eyre Sound, Patagonia, in the latitude of Paris. They tell us no more of the Meiocene climate of Europe than the glaciers at present in New Zealand[3] tell us of a climate which is sufficiently mild to allow of the growth of tree ferns and areka palms. It is impossible that a great climatal change could have taken place in the Meiocene age affecting Europe generally, without leaving its mark in the flora and in the fauna.

[1] See Croll, *Climate and Time*, pp. 306, 357.
[2] Lyell, *Principles*, i. p. 206, 10th edit.
[3] Lyell, *Principles*, i. 211.

One severe winter would have destroyed the evergreen forests, and the exotic plants and animals would disappear and be replaced by others capable of flourishing under the new conditions. The blocks of stone may have been carried down by glaciers from the Alpine chain, then lifted high up above the sea into the icy temperature which is to be met with everywhere on the earth at great altitudes. They may be referred to that glacial climate which is above our head even at the equator, rather than to glacial conditions extending down to the sea-level in Italy, in a period when the climate of middle and northern Europe was warmer than it is now—a period, moreover, in which, if Professor Heer's views be accepted, even in the Arctic Regions, it was sufficiently mild to allow the spruces, elms, and hazels, the hemlocks and swamp cypresses to flourish in Grinnell Land, almost as far north as latitude 82°,[1] and the vine, walnut, tulip tree, and mammoth tree to grow luxuriantly in Iceland.

No Proof of Man in Europe in the Meiocene Age.

Was man an inhabitant of Europe in the Meiocene age? Did he wander through the evergreen forests and hunt the deer, antelopes, and hogs, the Hipparions, Mastodons, and Deinotheres, then so numerous? The climate was favourable, and the food, animal and vegetable, was most abundant. The representatives of the higher apes were present in Germany, Switzerland, France, Italy, and Greece, and all the conditions were satisfied which have been put forward by Dr. Falconer and Sir John Lubbock as necessary to that primeval

[1] See Heer, *Quart. Journ. Geol. Soc. Lond.* xxxiv. p. 66, and *Flora Arctica.*

garden of Eden in which the first traces of man were to be sought. Meiocene Europe was fitted to be the birthplace of man, in its warm climate and in the abundance of food. There is, however, one most important consideration which renders it highly improbable that man was then living in any part of the world. No living species of land mammal has been met with in the Meiocene fauna. Man, the most highly specialised of all creatures, had no place in a fauna which is conspicuous by the absence of all the mammalia now associated with him.

Were any man-like animal living in the Meiocene age, he might reasonably be expected to be not man but intermediate between man and something else, and to bear the same relation to ourselves as the Meiocene apes, such as the *Mesopithecus*, bear to those now living, such as the *Semnopithecus*. If, however, we accept the evidence advanced in favour of Meiocene man, it is incredible that he alone of all the mammalia living in those times in Europe should not have perished, or have changed into some other form in the long lapse of ages during which many Meiocene genera and all the Meiocene species have become extinct. Those who believe in the doctrine of evolution will see the full force of this argument against the presence of man in the Meiocene fauna, not merely of Europe but of the whole world.

On the other hand, it is maintained by very high authorities—Dr. Hamy,[1] M. de Mortillet,[2] and others—that man inhabited France as early as the middle of the Meiocene age. This conclusion is founded partly on the

[1] *Paléontologie Humaine*, par M. le Dr. Hamy, p. 45 *seq.*, 8vo. *Quart. Journ. Science*, 1879.

[2] *Revue Prehistorique*, 1879, p. 117.

splinters of flint[1] found in the mid Meiocene strata at Thenay by the Abbé Bourgeois,[2] and on a notched fragment of a rib of an extinct kind of *manatee* (*Halitherium*) found at Pouancé by M. Delaunay. The data seem to me insufficient to establish the fact that man was a contemporary of the Deinothere and other members of the mid Meiocene fauna. Is it possible for the flints in question, which are very different from the Palæolithic implements of the caves and river deposits, to have been chipped or the bone to have been notched without the intervention of man? If we cannot assert the impossibility, we cannot say that these marks prove that man was living in this remote age in the earth's history. If they be artificial, then I would suggest that they were made by one of the higher apes then living in France rather than by man. As the evidence stands at present, we have no satisfactory proof either of the existence of man in the Meiocene or of any creature nearer akin to him than the anthropomorphous apes. These[3] views agree with those recently published by Professor Gaudry,[4] who suggests that the chipped flints and the cut rib may have been the work of the *Dryopithecus*, or the great anthropoid ape, then living in France. I am, however, not aware that any of the

[1] A collection of these flints is to be seen in the museum at St. Germain, some of which appeared to me, in 1876, non-artificial, while others had evidently, from the state of their surfaces, been exposed to the atmosphere for a considerable time. Those figured by Professor Gaudry (*Les Enchainements*, p. 239) are, to all appearance, artificial.

[2] *Congres Intern. Préhist. Archéol.*, Paris vol. p. 67 *et seq.*; Brussels vol. p. 81 *et seq.*

[3] This was written in September 1877, and used in the Owen's College Lectures of November 1877.

[4] *Les Enchainements*, p. 241.

present apes are in the habit of making stone implements or of cutting bones, although they use stones for cracking nuts.[1]

From the preceding pages the reader will have realised how different Europe of the Meiocene age was from the Europe of to-day; that the climate was much warmer, and that it was connected with Greenland, Spitzbergen, and North America; and that on the land so constituted, during the Eocene and Meiocene ages, luxuriant forests extended northwards far into the Polar regions. He will also have realised that, in the European part of this vast forest-covered continent, there was not one living species of mammal to be seen in the strange and varied fauna to herald the order of things that was to be, although there were many familiar trees and some reptiles, such as the alligator and crocodile. When all this is taken into account, it will be seen how improbable, nay, how impossible, it is that man, as we know him now, the highest and most specialised of all created forms, should have had a place in the Meiocene world. The evolution of the animal kingdom, recorded in the rocks, had at this time advanced as far as, but no farther than, the *Quadrumana*, and it seems to me not improbable that some of the extinct higher apes may have possessed qualities not now found in living members of their order.

[1] Even if the existing apes do not now make stone implements or cut bones, it does not follow that the extinct apes were equally ignorant, because some extinct animals are known to have been more highly organised than any of the living members of their class. The Secondary reptiles possessed attributes not shared by their degenerate Tertiary successors. The Deinosaurs and Theriodonts had structural peculiarities now only met with in the birds and the mammalia.

CHAPTER IV.

BIOLOGICAL AND PHYSICAL CHANGES IN NORTH-WESTERN EUROPE BEFORE THE ARRIVAL OF MAN.— THE PLEIOCENE PERIOD.

British Pleiocene Strata.—Geography of Britain in the Pleiocene Age.—Evidence of Icebergs in the North Sea, off the Coast of Britain.—The Pleiocene Flora.—Pleiocene Climate.—Lower Pleiocene Mammalia of France.—Upper Pleiocene Mammalia of France and Italy.—Pleiocene Mammalia in Italy.—Pleiocene Mammalia in Britain.—Important Characters of Fauna.—The Development of Antlers in the Deer.—The Retreat of the Quadrumana from Europe.—Evidence of Pleiocene Man in France and Italy unsatisfactory.

WE have seen in the two preceding chapters that man had no place in the Eocene and Meiocene faunas, because they present no traces of other living mammalian species. In this chapter we shall see that one living species, if not more, does occur in the Pleiocene strata of France and Italy, and that therefore the improbability of man having lived in Europe at that time is proportionally lessened. It is, however, very unlikely that he will ever be found in the Pleiocene strata of this country, because they are either purely marine, or consist of freshwater accumulations, which have been worked over and, for the most part, destroyed by the action of the waves on the beach during the depression of the land beneath the sea.

British Pleiocene Strata.

The Pleiocene strata of Britain, known as the Crags of Norfolk and Suffolk, extend over the eastern parts of those counties and over north-eastern Essex, and consist of sands and gravels more or less impregnated with iron, containing numerous shells, most of which are still living in our seas. They contain also singular accumulations of fossil bones, derived from the break-up of several different formations. In the phosphatic or coprolitic deposit, for example, of the Red Crag, there are fossil sharks, rays, and crabs from the London Clay, and fragments of land mammalia, such as the *Hyænarctos*, which have been derived from the destruction of Meiocene strata, in the area now occupied by the North Sea. There are also water-worn fragments of teeth, and bones of the Pleiocene mammalia, derived from the destruction of old land surfaces, in the Coralline and Red Crags, as well as in that of Norwich. These strata, therefore, are the marine equivalents of the accumulations on the borders of ancient lakes, and in the ancient river valleys, which have afforded so rich and varied a Pleiocene fauna and flora in France and Italy, although in point of time they may be referred to the later, rather than the earlier, stage of the Pleiocene, because the mammalia which they contain have been washed out of the strata in which they were originally buried. The mammalia, however, of the Norwich Crag are considered by Professor Prestwich to be[1] in part undisturbed. The lower portion of the mammaliferous deposit at Thorpe, near Norwich, seems to me to be an isolated fragment, which happens to have been spared

[1] *Quart. Jour. Geol. Soc. Lond.* xxvii. p. 479.

by the waves on the submergence of that part of the Pleiocene land.

The British Pleiocene strata[1] are divided into the following groups.

		Feet.
Newer Pleiocene of Lyell.		
Westleton beds, Chillesford Clay.	Marine	?
Aldeby beds, Norwich Crag (Mammalia).	Fluvio-Marine	20
Older Pleiocene of Lyell.		
Red Crag, Phosphatic or coprolite beds.	Marine	20 ?
Coralline Crag (Polyzoa).	Marine	30

Geography of Britain in the Pleiocene Age.

The Pleiocene coast-line of Great Britain is marked by the marine deposits above mentioned in East Anglia, which were accumulated by the sea that swept over the district to the east of a line passing from the mouth of the Thames to Colchester and Ely, and extended in the direction of Holland and Belgium as in the Meiocene age (Fig. 10).

The North Sea, which was small in the Meiocene age (Fig. 6), and did not touch our present coast-line, was now gradually enlarged at the expense of the land, and ultimately a direct communication was made with the Arctic Sea, by the sinking of the land extending from the Scandinavian mountains and the British Isles to Iceland and Greenland on the one hand, and Spitzbergen on the other. This depression is proved by the presence of northern types of marine shells as far south as the coasts

[1] See Prestwich, *Quart. Journ. Geol. Soc. Lond.* xxvii. pp. 115, 325, 452.

of Suffolk and Essex (See Fig. 10). The Pleiocene coast-line touched also the eastern coast of Scotland near Aberdeen, where Red Crag strata are met with containing the characteristic shell, *Voluta Lamberti*.[1] This depression, by which the Arctic became continuous with the

FIG. 10.—Geography of Britain in the Pleiocene Age.

North Sea, caused it also to become connected with the Atlantic. The Atlantic coast-line at this time may be taken to be marked by the steep slopes passing downwards from the 100-fathom line to 300 or 400

[1] Jamieson, *Quart. Journ. Geol. Soc. Lond.* xxi. p. 474.

fathoms, which imply that a land barrier was in that position for a very long period. It would make but very little difference to the Map of Pleiocene Britain if we were to take the western coast-line to be marked by the 300 instead of the 100 fathom line.

It will be observed by the comparison of the Maps, Figs. 6 and 10, that the geography of Britain in the Meiocene age was modified in the Pleiocene only in two important points—the letting in of the Arctic waters into the North Sea, and their free communication with the Atlantic by the submergence of the area between the Shetlands and Iceland. In other respects, Pleiocene Britain was as it had been before, and plants and animals could migrate over the dry land then uniting France, Spain, and England together, without being confronted by a physical barrier. A geographical continuity of this kind in ancient times was considered by Professor Edward Forbes [1] necessary for the presence of certain Spanish plants such as *Arabis ciliata* and *Pinguicula grandiflora* in the south of Ireland.

The Pleiocene mountains were similar to our present mountains, but were undoubtedly higher, because of the enormous amount of denudation which they have undergone in post-Pleiocene ages, as well as from their then rising from a base at least 600 feet above their present bases. The line of lofty volcanic cones, also, in the Hebrides probably had not altogether lost their subterranean fires in the early Pleiocene ages. Clusters of small lateral cones or *puys* sprang up on their flank like those on Mount Etna, but they, too, were gradually

[1] "Geological Relations of Fauna and Flora of the British Isles." *Memoirs of Geological Survey*, i. p. 348.

deserted by the expiring energy; and the volcanoes[1] of the Western Islands, inert and cold, became a prey to the ravages of the elements which have reduced them to their present condition. How vast this destruction was has already been placed before the reader in treating of the Meiocene mountains, p. 44.

The Pleiocene rivers in Britain were in their present positions, though they flowed at a higher level, and those on the west opened upon the Atlantic coast-line, then far away from their present mouths, as is shown in the map (Fig. 10).

Evidence of Icebergs in the North Sea, off the Coast of Britain.

The researches of Professor Prestwich[2] and Mr. Searles V. Wood into the mollusca of the British Pleiocene strata show that the temperature of the sea gradually became lowered in passing from the period of the Coralline Crag towards the upper deposits. This lowering of the temperature caused the area of the North Sea to be invaded by northern forms, and compelled the retreat of the southern species now found in the warm waters of the Mediterranean, as may be seen from the following table, constructed by Professor Prestwich, from which all the species common to the crags and the British seas of the present time are omitted.

		Species now restricted to	
		Northern Seas.	Southern Seas
Norwich Crag . .	130	19	11
Red Crag . . .	216	23	32
Coralline Crag . .	264	14	65

[1] Judd, *Quart. Geol. Journ. Lond.* xxx. p. 274.

[2] *Quart. Geol. Journ. Lond.* xxvii. p. 474. Crag Mollusca, *Palæont. Soc.*

From this table it is clear that the southern shells were being driven away from their habitation by the depression of the temperature of the water in which they had lived, and that they were being slowly replaced by those of a northern habit; the increase in the number of the latter, as Sir Charles Lyell acutely points out, being from 5·0 per cent in the Coralline Crag to 10·7 per cent in the Red, and 14·6 in the Norwich Crags. This was due to a more intimate connection with the Arctic Ocean, and to the consequent invasion of the British area by currents of cold water. But we have other evidence that this was the case. Professor Prestwich calls attention to a large block of porphyry in the Coralline Crag at Sutton, which is undoubtedly ice-borne, and Sir Charles Lyell mentions unworn and angular chalk flints in the Red Crag which have been transported by the same agency. From these facts we may infer the presence of floating ice in the North Sea in the Pleiocene age, and it is very probable that this was brought about, not merely by a general lowering of the temperature in the northern regions, such as Scandinavia, but also by the submergence of the tract of land uniting Iceland with the continent of Meiocene Europe, by which currents of cold water from the Polar regions obtained free access to the North Sea of the Pleiocene age,[1] from which they had before been shut out by a barrier of land.

[1] For a full statement of the arguments see Lyell, *Antiquity of Man*, 1873, p. 248 *et seq.*; Prestwich, *Quart. Journ. Geol. Soc. Lond.* xxvii.; Searles Wood, Crag Mollusca, *Palæont. Soc.* 1873, and *Quart. Journ. Geol. Soc. Lond.* xxii. p. 541.

The Pleiocene Flora.

The vegetation of central and southern France, and of northern Italy in the Pleiocene age, is intermediate in character between the wonderful evergreen flora of the Meiocene and that now living in southern Europe; and, like the former, it is composed of plants, some of which are found only in widely remote districts, such as Japan, North America, Madeira, and the Canaries. The recent investigations of the Count de Saporta[1] into the flora of Meximieux show that the forests which covered the neighbourhood of Lyons comprised bamboos, liquid-ambars, rose-laurels, tulip-trees, large-leaved maples, ilices, and glyptostrobi, together with magnolias, poplars, willows, and other familiar trees. There were no less than five kinds of laurels, among which may be noted the til and the vinatico, two trees growing in the forests of the Canaries, and no longer living in Europe. The forest composed by this vegetation was mainly evergreen, and like that of the Canaries in luxuriance.

This Pleiocene forest has been proved, by the researches of M. Gaudin and the Marquis Strozzi,[2] to have extended into the upper valley of the Arno, and to be composed for the most part of the same trees as those mentioned above. It probably occupied a region but little removed above the sea-level in middle Europe, since the Count de Saporta has shown that the Pleiocene vegetation of Ceyssac in Cantal, which lies buried under volcanic ash, is of a very different character, consisting,

[1] De Saporta, *Recherches sur les Végétaux Fossiles de Meximieux, Archives du Museum d'Histoire Nat. de Lyon.* 4to, t. 1, 1875-6.

[2] Lyell's *Student's Elements*, 2d edit., p. 190. Gaudin and Strozzi, *Feuilles fossiles de la Toscane. Contributions à la Flore fossile Italienne.*

for the most part, of deciduous trees, maples, alders, poplars, willows, elms, and ashes, with an undergrowth of bog-whortleberries (*Vaccinium uliginosum*). These are found at a height of 700 mètres above the sea, while that of Meximieux is about 200 mètres. Yet a higher zone is met with at St. Vincent in the Cantal at 1200 mètres above the sea, in a forest buried under lava, which consisted of pines, among which one (*Abies pinsapo*) grows in Andalusia, in regions between 1100 and 2000 mètres high.

These three zones of forest growth, so ably interpreted by M. de Saporta, were probably to be met with only in central and southern Europe where there were mountains. The evergreen forest did not extend far beyond the latitude of Paris, and the deciduous trees probably formed a belt extending over the low country of Britain and northern Germany, while the sombre forest zone of pines was to be seen still farther north. The cinnamon trees and the sabal palms (see Fig. 8), which in the Meiocene times had extended as far north as the Lower Rhine, in the early Pleiocene age were restricted to the region of Italy.

Pleiocene Climate.

The climate necessary for the growth of the flora of Meximieux is one considerably hotter, as well as more moist, than that of the neighbourhood of Lyons at the present time. The winters must have been mild and the heat of summer above 20° centigrade to allow the *Nerium* to flower, the bamboos to flourish, and the fruits of the pomegranate to ripen. The mean annual temperature necessary for these is estimated by M. de Saporta at 17° (62·6 Fahr.) centigrade, or about eight degrees more than

the mean annual temperature of Palermo at the present time. Meximieux touches the 46th degree of latitude, while Palermo is in 38·7°.

The difference between these two latitudes gives us the means of estimating the climate with great precision. We may conclude that the isothermals in Pleiocene Europe were eight degrees farther north than they are at the present time. The climate was colder than in the preceding Meiocene age, when the evergreen forests spread as far north as the British Isles.

Lower Pleiocene Mammalia of France.

We have seen, from the study of the vegetation, that the European climate was warmer in the Pleiocene age than it is now. This conclusion is confirmed by an examination of the mammalia of France, which fall naturally into two groups,[1] namely, those of Montpellier, or the Early Pleiocene, and those of the fluviatile and lacustrine strata in the neighbourhood of Issoire and Clermont, which belong to the later division, as defined by Professors Gervais and Gaudry.[2]

In the Pleiocenes of Montpellier we have evidence of an association of animals analogous to that of the warmer regions of eastern Asia. Among others are the tapir, rhinoceros (*R. megarhinus*), and a deer (*Cervus australis*) closely allied to the muntjak of the Oriental region. Two kinds of apes inhabited the forests, and found abundant food in the pomegranates and other fruits; one (*Macacus*), allied to the macaque of the East Indies

[1] For lists of these animals, see Appendix III.

[2] Gervais, *op. cit.*; Gaudry, *Animaux Fossiles de Mont Lébéron*, 4to, p. 86.

and northern Africa, and the other, a *Semnopithecus*, scarcely distinguishable from that of Southern Asia. The genus Mastodon of the preceding Meiocene age is represented by two gigantic species (*Mastodon arvernensis* and *M. brevirostris*) and the Meiocene antelopes, so abundant in southern France, by one solitary species, the *Antilope cordieri*. The hogs also here, as in the Meiocene age, possess small canines, apparently not having yet assumed, as Professor Gaudry remarks, the sexual character so marked in the wild boars of the succeeding ages. The carnivores consisted of a bear, a singular animal (*Hyænarctos*), found also in the Himalayas, as large as a grisly bear, and a cat (*F. Christolii*) about the size of a serval. Numerous rorquils and dolphins lived in the adjacent sea, as well as the halithere, so closely allied to the manatee of Africa and America.

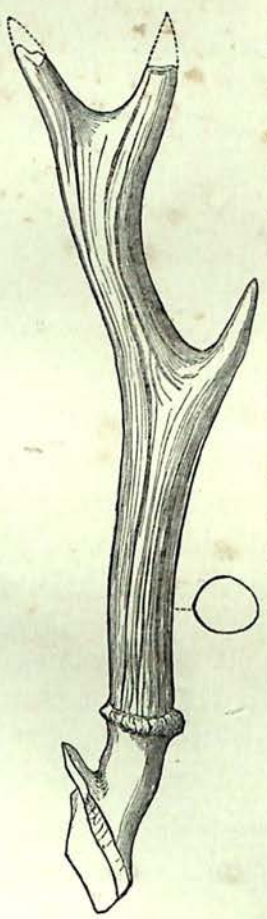


FIG. 11.—*Cervus cusanus*, Cr. and Job., Pleiocene. Ceyssac, ⅓.

Upper Pleiocene Mammalia of France.

The mammalia of the Upper Pleiocenes of Auvergne present many points of contrast with the preceding group. We find, indeed, the same mastodon and rhinoceros (Fig. 18); a species of tapir also is present, a hog, and a kind of bear (*Ursus arvernensis*) of the size of the common brown bear of Europe; but here they are

associated with *Elephas meridionalis* (Fig. 18), the earliest of the true elephants discovered in Europe, and characterised by the possession of teeth intermediate in

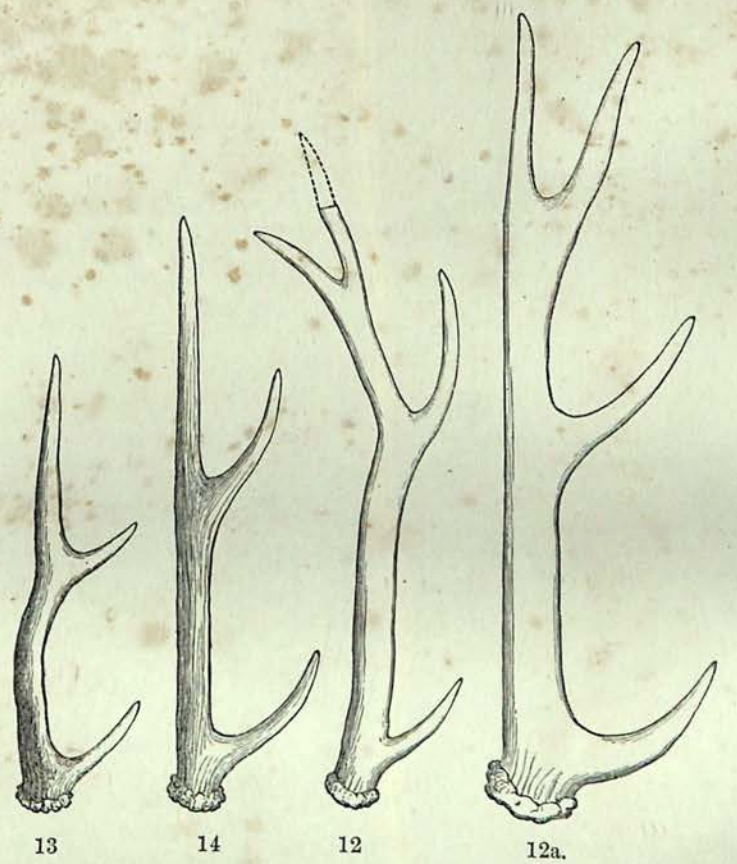


FIG. 12.—*Cervus perrieri*, Cr. and Job., Mont. Perrier, $\frac{1}{5}$
,, 12a.—*C. issiodorensis* . . . $\frac{1}{5}$.
,, 13.—*C. etueriarum* . . . . $\frac{1}{5}$.
,, 14.—*C. pardinensis* . . . . $\frac{1}{5}$.

structure between those of the mastodon and the Indian elephant. A hippopotamus is present also (*H. major*), which I am unable to distinguish from the numerous varieties of the river horse (*Hippopotamus amphibius*)

of Africa. The hipparion also, an upper Meiocene genus, is found at Malbattu, but is very rare. In place

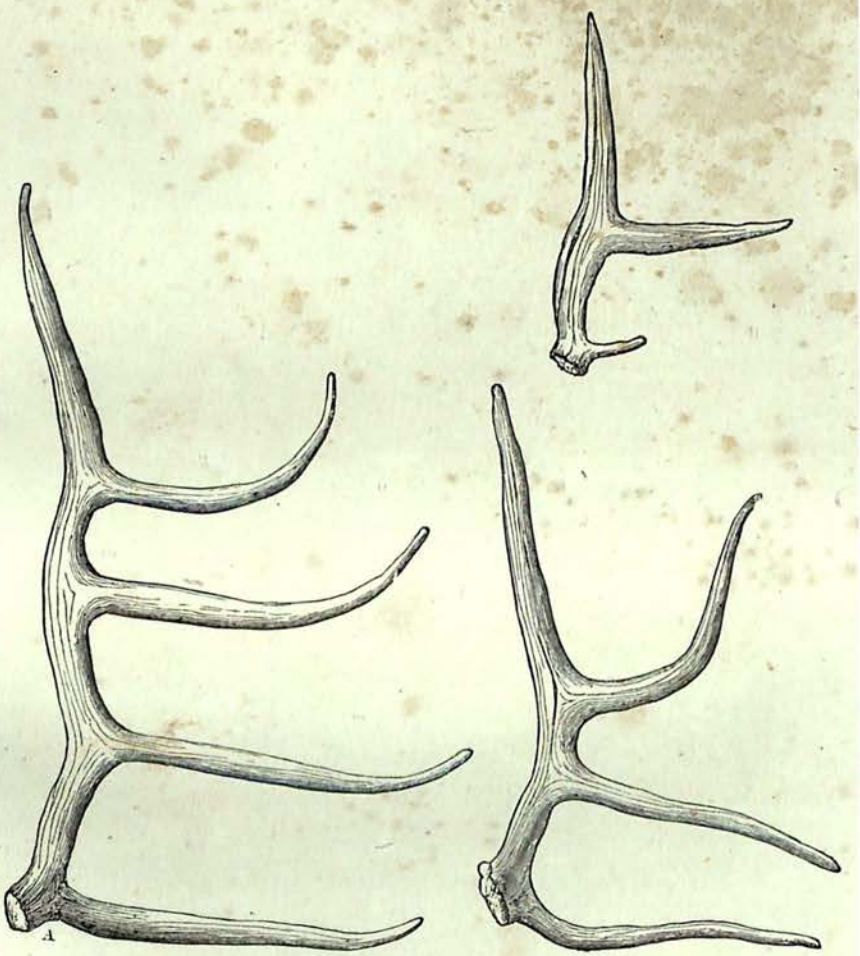


FIG. 15.—*Cervus tetraceros*, Peyrolles, $\frac{1}{8}$.

of antelopes there is a most remarkable assemblage of different kinds of deer,[1] one of which (*Cervus cusanus*) possessed antlers similar to those of the roe (Fig. 11);

[1] For an account of the Pleiocene and Meiocene deer, see Dawkins, *Quart. Jour. Geol. Soc. Lond.* xxxiv. p. 402.

while others, such as *Cervus perrieri* and the variety *C. issiodorensis* (Figs. 12, 12a), are closely allied to the *C. taivanus* of eastern Asia, while others, again (*Cervus etueriarum* and *C. pardinensis*, Figs. 13, 14), can scarcely be distinguished from the axis or spotted deer of India. Some of them (*Cervus tetraceros*) are wholly unlike any living form of deer in the shape of their antlers (Fig. 15). These were the prey of bears and wolves and felines allied to the panther and lynx, as well as of the great sabre-toothed *Machairodus*, the most formidable of all the carnivora. At night the Pleiocene forests of central France echoed with the weird laughter of the hyæna, belonging to two extinct species, *H. perrieri* and *H. arvernensis*.

Upper Pleiocene Mammalia of Italy.

The mammalia inhabiting the Pleiocene forests of the Val d'Arno, and recently classified by Dr. Forsyth Major, are more closely allied to the fauna of Auvergne than to that of Montpellier. In them the *Elephas meridionalis* and *Mastodon arvernensis*, and the hippopotamus, lived side by side. We also meet with a bear (*Ursus etruscus*) which differs very slightly from that of Auvergne; the *Machairodus*, the fossil hyæna, and two deer of the oriental forms above mentioned, are common to both regions. Very possibly also the hog (*Sus Strozzi*) may be merely a local race of that of Auvergne. Besides these animals, however, common both to France and Italy, there are some peculiar to the latter possessed of very remarkable characters. An ox (*Bos etruscus* of Falconer) presents us with the first instance of polled cattle. A horse (*Equus Stenonis*),

intermediate in the structure of its feet and teeth between the common horse and the hipparion, may perhaps indicate that Pleiocenes of the Val d'Arno belong to a later stage of evolution than those of Auvergne, in which the Hipparion is discovered unaccompanied by its descendant the horse. The third is a deer (*Cervus dicranios* of Nesti), with antlers so complicated that they almost defy description (See Fig. 16). The view that

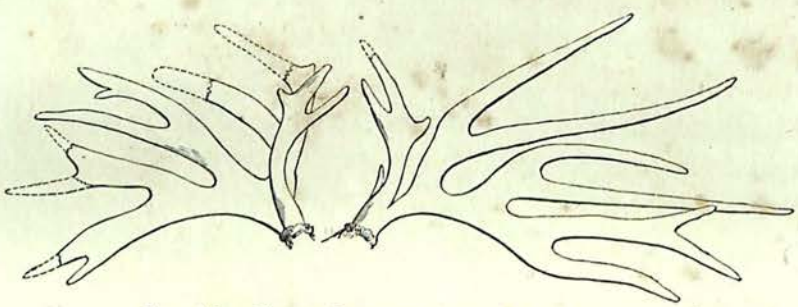


FIG. 16.—*Cervus dicranios*, Nesti, Val d'Arno, $\frac{1}{12}$.

these strata are of a later age than those of Auvergne is rendered probable by the fact that a rhinoceros (*R. etruscus*) and an elephant, identified by Dr. Falconer in the former, are not known to be present in the latter. Two kinds of monkeys, allied to the macaque of Barbary,[1] lived in the forests of the Val d'Arno, and two kinds of beavers inhabited the streams.

Pleiocene Mammalia in Britain.

This rich and varied mammalian fauna is represented very scantily by the water-worn fragments in the English Pleiocenes; among which may be recognised the

[1] *Macacus florentinus.* Cocchi, *Aulaxinus Bolettino Geologico*, 3 and 4. March and April 1872. *Act. Soc. Ital. des Sc. Nat.* xv. 1872.

Mastodon arvernensis, the *Elephas meridionalis*, and the bear of Auvergne. A deer allied to the axis, or spotted deer of India (*Cervus suttonensis*, Fig. 17), is one of the most abundant mammals of the Red Crag, and it has been met with also in the French Pleiocenes; a second species of deer (*Cervus falconeri*), of an extinct type, has not been met with in any of the continental deposits. A third (*C. issiodorensis*, Fig. 12a) is found also in France. There were also hyænas and beasts of prey allied to the leopard. The *Hipparion* and the tapir and *Hyænarctos*, in the same strata, are as likely to have been derived from the break up of strata of the same age as the upper Meiocenes of Darmstadt as from the destruction of the equivalents of the Pleiocenes of France and Italy.

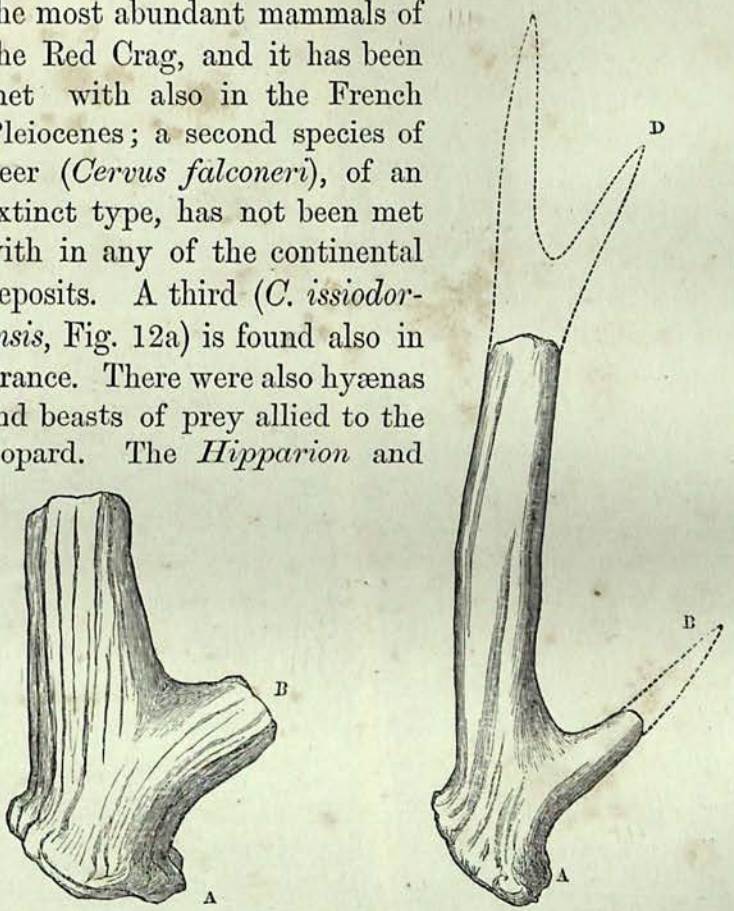
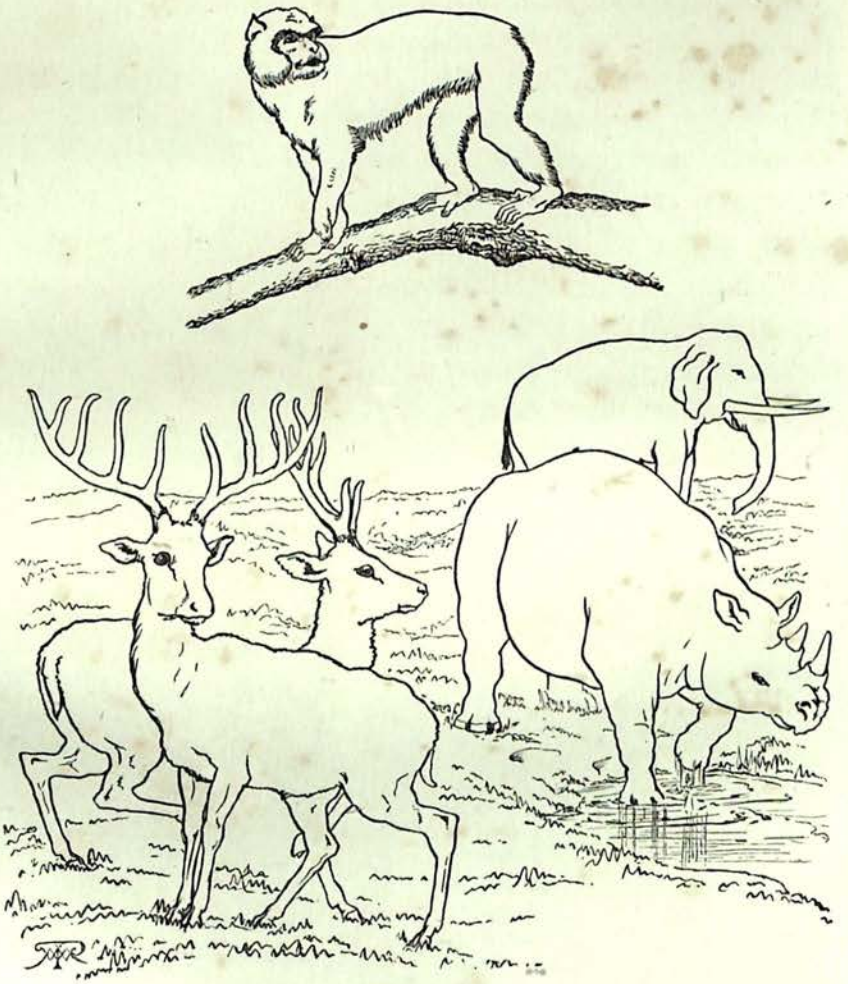


FIG. 17.—*Cervus suttonensis*, Dawk., Red Crag, Sutton, ½.

Important Characters of Fauna.

The most important facts to be observed in our study



Macaque.

Cervus pardinensis.
Cervus tetraceros.

Elephas meridionalis.
Rhinoceros megarhinus.

FIG. 18.—Upper Pleiocene Mammalia.

of the Pleiocene mammalia, so far as relates to the association of living with extinct genera, are as follows:—

In the lower Pleiocene two kinds of ape, the Macaque and *Semnopithecus* (Fig 18), make their appearance, as well as the genus bear; while in the Upper Pleiocene period the marmots (*Arctomys*), voles (*Arvicola*), elephants (*Elephas*), oxen (*Bos*), and dog family (*Canis*), also appear for the first time. The hippopotamus is the first living species of placental mammal of which we have any record in the European strata.[1] It must also be remarked that the oxen (*Bos etruscus*) were sometimes devoid of horns, as may be seen in a specimen pointed out to me by Dr. Forsyth Major in the Museum at Florence. It seems very likely that horns were originally a mere sexual character peculiar to the males, and transferred ultimately, like other sexual characters, to the females. This was brought about before the beginning of the Pleistocene age, since all the oxen of that era possessed horns. If this view of the origin of horns be accepted, it is easy to explain the singular ease with which, in a comparatively short time, the horns have been bred out of some of the domestic cattle, by selection[2] carried on through a few generations, and our polled cattle may be looked upon as a reversion to an ancestral type. The small size also of the tusks of the domestic hogs, as compared with those of the wild boar, may be explained in the same manner.

In Fig. 18 five upper Pleiocene animals are grouped together, two deer respectively of extinct and living types, the big-nosed rhinoceros, the southern elephant,

[1] It is by no means certain that some of the Pleiocene deer of the section *Axeidæ* are not specifically identical with the Axis and *Cervus taivanus* of southern and eastern Asia. See *Quart. Journ. Geol. Soc.* xxxiv. 402.

[2] On this point see a letter of the Earl of Selkirk, published in my *Preliminary Treatise, British Pleistocene Mammalia.* Palæont. Soc. 1878, p. xiv.

and the ape; the last being here, as in the Meiocene age (Fig. 8), the most highly specialised form.[1]

The Development of Antlers in the Deer.

It is not out of place here to call attention to the history of the development of antlers in the deer. In the lower Meiocenes no member of the family possessed antlers. In the mid Meiocene strata of the age of the Sables de l'Orléanais, Professor Gaudry[2] notes small, erect, branching antlers persistent through life of *Procervulus aurelianensis* of Thenay. This most remarkable antler, characterised by the absence of a burr or rose, is identical with that figured and described by Professor Leidy[3] from *Niobrara*, and considered by him intermediate between the antlers of the deer and the horns of the antelopes. It may fairly claim to be the most rudimentary form of antler belonging to a type which is no longer represented. The true starting-point of the antlered deer of the post-Meiocene ages is presented by the simple forked crown of the *C. dicroceros* of the mid Meiocene (Fig. 8). The cervine antler in the upper Meiocene becomes more complex, but is still small and erect like that of the roe. In the Pleiocene it becomes larger and longer, and altogether more complex and differentiated, some forms, such as the *Cervus dicranios* (Fig. 16) of Nesti, being the most complicated antlers known either in the living or fossil state. These successive changes are analogous to those which are to be observed in the development of the

[1] In this group the *Macacus inuus* of Barbary represents the upper Pleiocene apes.

[2] Gaudry, *Les Enchainements*, p. 87.

[3] Leidy, *Extinct Mammalian Fauna of Dakota and Nebraska*, 4to. Acad. Nat. Sc., Philadelphia, second series, vii. Pl. xxviii. Fig. 8.

antlers in the living deer, which begin with a simple point, and increase the number of tynes until their limit is reached. It is obvious, from the progressive diminution in size and complexity of the antlers in tracing them back from the Pleiocenes into the mid Meiocenes of Europe, that in the latter period we are approaching the zero of antler development. In the lower Meiocenes I have failed to meet with evidence that the deer possessed any antlers.

It is also a point of singular interest to observe that the nearest living analogue of the Meiocene deer is the muntjak, now only found in Asia along with the tapir. *Cervus dicroceros* also co-existed with that animal in the upper Meiocene forests of Germany. With one exception, all the Pleiocene deer which can be brought into relation with living forms are closely allied to the Axes, Rusæ, or others, which also are dwellers in the Oriental region. They belong to a fauna now met with only in the forests of India, China, Japan, and the Malay Archipelago. The exception is the *Cervus cusanus*, which possessed an antler not very far removed from that of the roe, an animal now so widely spread over Europe and northern and central Asia. I should infer from this that the Oriental region has offered a secure place of refuge to the *Axeidæ*, so abundant in the Pleiocenes of France and Italy, from those changes in their environment which compelled them to retreat from Europe. The fact of the presence, in this quarter of the world, of a group of animals now met with only in warm regions, confirms the conclusions as to the warm climate of Pleiocene Europe, which M. de Saporta has recently arrived at from a study of the vegetation.

The Retreat of the Quadrumana from Europe.

The disappearance of the apes from Europe at the close of the Pleiocene age is one of the most important facts to be recorded in the history of the mammalia. In the upper Meiocene the apes ranged as far north as Eppelsheim, in the lower Pleiocene they were restricted to the forests of the south of France, and in the upper Pleiocene to those of Italy. Their gradual southern retreat and final extermination in Europe[1] are probably due to a change in climate,—to a lowering of the temperature, which arrived at its maximum in the Pleiocene age.

Evidence of Pleiocene Man in France and Italy unsatisfactory.

In dealing with the question of the presence of man in Europe, we have seen that he could not reasonably have been expected to have been a member of faunas in which the mammalia were represented solely by extinct species. In the Pleiocene age there is no inherent improbability of man having been present, seeing that at least one living animal shows that living forms had a footing among those which have become extinct. The family of lemurs made its appearance both in Europe and in America in the Eocene; the apes, or *Simiadæ*, in the Meiocene. Did the next family in the classification of the naturalists, or that of man, appear in Europe in the Pleiocene? An affirmative answer to this question is considered, by several eminent observers, to be given by the discovery of human remains in Italy.

The first to be noticed is a human skull, discovered

[1] The Barbary ape has been introduced into Gibraltar.

by Professor Cocchi in a railway cutting at Olmo,[1] near Arezzo, at a depth of about 15 mètres from the surface. It is preserved in the museum at Florence; is well formed and long, and of a high type. The conditions, however, of its discovery seem to me to be very unsatisfactory. It was found after a slip in the sides of the cutting, and there is no evidence that the stratum in which it had been imbedded had not been disturbed. A flint implement was found with it, which is pronounced by Mr.

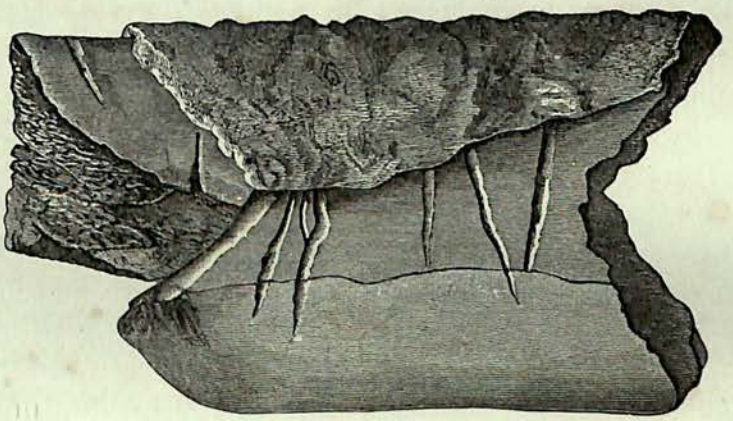


FIG. 19.—Fragment of Cut Rib from the Tuscan Pleiocenes.

Evans to belong to a well-known Neolithic type. This stamps the age of the skull to be Neolithic and not Pleiocene; a conclusion which, indeed, might have been arrived at from its identity with a type of skull extremely common in Europe at that time.

A second case of the reputed occurrence of traces of man in Pleiocene strata is founded on a series of cut bones obtained from the Pleiocenes of Tuscany by Mr. Lawley, and preserved in the Museum at Florence. These specimens, which have been figured and described

[1] Cocchi, *Mem. della Soc. Ital. di Sc. Nat.* ii. No. 7. Milano, 1867. Forsyth Major, *Soc. Ital. di Antropologia e di Etnologia*, 20 April 1876.

by Professor Capellini,[1] to whose kindness I owe the opportunity of examining them in 1876, seem to me to have been notched artificially. In one case, a bone had been partially cut through and broken off at the line of cutting (Fig. 19), in the same way as many cut antlers of stag obtained from the Swiss lake-dwellings. The cuts have been made before the mineralisation of the fragments, one of them in particular being covered with an incrustation of sulphate of barytes. Now they are so hard that they could not be scratched by any stone implement. Along with them were flint flakes and a fragment of rude pottery. It is not, however, to my mind satisfactorily shown that these were obtained from undisturbed strata. Nor is the mineralisation a proof of their high antiquity, since we know how rapidly deposits of sulphate of barytes have sometimes been formed in the the wooden pipes of coal mines. It seems to me more prudent to wait for further proof of the presence of man in Europe at this time, for although it be allowed that the cuts are artificial and made by flint flakes, there is no proof that the mineralisation of the bones may not have taken place in comparatively modern times. Pottery was unknown in Europe in the Pleistocene, and therefore is unlikely to have been known in the Pleiocene age.

There is an argument against the probability of man having lived in Italy in Pleiocene times that seems to me unanswerable. Twenty-one fossil mammalia have been recently proved by Dr. Forsyth Major to have inhabited Tuscany in the Pleiocene age: of these there is only one species, the hippopotamus, now alive

[1] L'uomo Pliocenico in Toscana, *Letta alla Reale Acad. dei Lincei.* 7 May 1876.

on the earth. It is to my mind to the last degree improbable that man, the most highly specialised of the animal kingdom, should have been present in such a fauna as this, composed of so many extinct species. They belong to one stage of evolution, and man to another and a later stage.

The same objections may be made to the so-called fossil man of Denise[1] in France, in the Museum of Le Puy, found in volcanic tufa, and who is supposed to have fallen a victim to showers of ashes from a Pleiocene volcano. In this case, as in the rest, we cannot be certain that the deposit has been undisturbed since its first formation, nor is its precise geological horizon well ascertained.

As the evidence stands at present the geological record is silent as to man's appearance in Europe in the Pleiocene age. It is very improbable that he will ever be proved to have lived in this quarter of the world at that remote time, since of all the European mammalia then alive only one has survived to our own days. Nevertheless, the arrival of one solitary living species marks the dawn of that order of nature to which man belongs, and in which, in the succeeding Pleistocene age, he formed the central and most imposing figure.

[1] See Lyell, *Antiquity of Man*, 4th edit., 1873, p. 228.

CHAPTER V.

BIOLOGICAL AND PHYSICAL CHANGES IN BRITAIN AT THE TIME OF THE ARRIVAL OF MAN.

Definition of Pleistocene Period. — Survivals from Pleiocene Period. —Incoming Living Species of Temperate Habit.—Incoming Arctic Species. — Incoming Species now restricted to Mountains. — Incoming Species now living in Hot Countries.—The Extinct Species.— Evidence from Distribution of Mammalia as to Geography of Europe.— Evidence as to Climate offered by Mammalia.—Climatal and Geographical Changes proved by Glacial Phenomena.—Relation of Mammalia to Glacial Phenomena.—The Three Divisions of the Pleistocene Age.— Pleistocene Mammalia in Britain before, during, and after the Glacial Period.

We have arrived now at that stage in the inquiry when new mammals appear, belonging for the most part to living species; and we shall see in the course of this and the two succeeding chapters, that their remains are associated with human implements in such a manner as to show that man was a member of the fauna which characterises the Pleistocene period of this quarter of the world.

Definition of the Pleistocene Period.

The Pleistocene mammalia, found in the deposits of rivers and in ossiferous caverns, present a remarkable

contrast to those which preceded them in Europe. Instead of the one or two living species of the Pleiocene age, there are many, and they preponderate greatly over the extinct, standing to them in the relation of fifty-five to twenty-two, out of a total of seventy-seven. They may be divided into groups, which throw great light on the climatal and geographical conditions under which man lived in Europe.[1]

Survivals from Pleiocene Period.

The first group to be noted consists of survivals from the preceding age. One living species, now only found in Africa south of the Sahara, and seven extinct, survived the changes which caused the destruction of the rest of the Pleiocene mammals, as may be seen in the following list:—

Survivals from Pleiocene, Living Species = 1.

African hippopotamus . .	*Hippopotamus amphibius.*

Survivals from Pleiocene, Extinct Species = 7.

Sabre-toothed lion . .	*Machairodus latidens*, Owen.
Bear of Auvergne . . .	*Ursus arvernensis.*
Big-nosed rhinoceros (Fig. 18)	*Rhinoceros megarhinus*, Christol.
Etruskan rhinoceros . .	*R. etruscus*, Falc.
Sedgwick's deer (Fig. 16) .	*Cervus dicranios*, Nesti.
Deer of Polignac . . .	*C. polignacus*, Robert.
Southern elephant (Fig. 18) .	*Elephas meridionalis*, Nesti.

[1] In working out the ranges of the animals in this chapter, I have chiefly used works of the following authors:—Blackmore and Alston, "Arvicolidæ," *Proceed. Zool. Soc.*, 1874, p. 460; Bell, *British Quadrupeds*, 8vo, 1837; Blasius, *Fauna der Wirbelthiere Deutschlands*, 8vo, 1857; Busk, *Trans. Zool. Soc.*, x. Part II.; Clermont, Lord, *Quadrupeds and Reptiles of Europe*, 8vo; Dawkins and Sanford, "British Pleistocene Mammalia," *Palæont. Soc.*, 1866; Desmarest, *Mammalogie*, 4to, Paris, 1820; Falconer, *Palæontographical Memoirs*, 2 vols. 8vo, 1868; Fischer, *Synopsis*

Incoming Living Species of Temperate Habit.

The incoming Pleistocene species, constituting the second group, now found in the temperate zones of Europe, Asia, and America, consist of animals of widely-different habits and range. The musk shrew, now restricted in Europe to the streams of southern Russia, and especially to the region of the Don and Volga, haunted the rivers of Norfolk (Bacton) in the Pleistocene age. The pouched marmot, now ranging eastwards from Austria and Poland through southern Russia, the Crimea, and Siberia to Kamtchatka, hibernated in Wiltshire (Fisherton) and in Somerset (Mendip Caves); and the field vole of central Europe and western Siberia (*Arvicola arvalis*) ranged as far to the west as Bath. At the present time three species of pika or tailless hares inhabit Siberia, of which one (*Lagomys pusillus*) lives as far west as the Volga. In the Pleistocene age the genus ranged as far to the west as Gibraltar, and the above-mentioned species seems to me identical with the (*Lagomys spelæus*) cave-pika of Brixham and Kent's Hole. The saiga antelope, now found no farther to the west than Poland, and most abundant in the region between the Volga and the river Irtisch, south of 55° N. lat., migrated as far to the west as Auvergne (Caves of the Dordogne); and the fallow deer, now only indigenous in the warm regions of the Mediterranean, wandered as far north as Harwich, being represented by a variety (*Cer-*

Mammalium, 8vo, Stutgart., 1830; Forsyth Major, *Atti Soc. Tosc. Sc. Nat. Pisa*, iii. 1876-9; Murray, *Geographical Distribution of Animals*, 4to; Pallas, *Zoographia Rosso-Asiatica*, 3 vols. 4to, *Spicilegia Zoologica*, 4to, 1777; Pennant, *Arctic Zoology*, 2 vols. 4to, 1784; Owen, *British Fossil Mammalia*, 8vo, 1846, *Palæontology*, 8vo, 1860; Richardson, Sir John, *Fauna Boreali-Americana*, 4to; Zimmerman, *Specimen Zoologiæ*, 4to, 1777.

vus Browni) discovered at Clacton. The bison, now preserved from extermination in a half-wild state in the imperial forests in Lithuania, and living in freedom in the Urals and Caucasus, roamed over the whole of Europe, as far to the north-west as Yorkshire. Its bones and teeth, found in northern Siberia and in Eschscholtz Bay, and other localities in North America, prove that in former times the herds, now rapidly being destroyed by the hunters in the tract of country extending from New Mexico into the British Dominions, were conterminous

FIG. 20.—Canine of Grisly Bear, Windy Knoll, Castleton, ½.

with those of Asia. From Behring's Straits to Italy and Spain the remains of the bison are very generally found with those of the horse. The latter animal, as well as the urus, now only lives under the care of man. Among the incoming carnivores belonging to the temperate zone, the most important is the grisly bear (Fig. 20), the fossil remains of which, according to Professor Busk, are met with from Gibraltar, in the south-west, as far to the north as Britain and Belgium. At the present time the brown and grisly bears inhabit the same regions in North America, and we need therefore feel no surprise that they should be found together in the Pleistocene

strata of Europe. The wolf and the fox range throughout Europe, Asia, and North America, as far north as the Arctic Sea.

Incoming Species now Living in the Temperate Zone = 33.

Great bat	*Vespertilio noctula*, Desm.
Great horse-shoe Bat	*Rhinolophus ferrum-equinum*, Bell.
Mole	*Talpa Europæa*, L.
Musk shrew	*Mygale moschata*, Fischer.
Common shrew	*Sorex vulgaris*, L.
Mouse	*Mus musculus*, L.
Beaver	*Castor fiber*, L.
Hare	*Lepus timidus*, L.
Pika	*Lagomys pusillus*, Pall. (= *L. spelæus*, Ow.)
Pouched marmot	*Spermophilus citillus*, Pall.
Water vole	*Arvicola amphibius*, L.
Red field vole	*A. glarcolus*, Schreb.
Short-tailed field vole	*A. agrestis*, L.
Continental field vole	*A. arvalis*, Pall.
Lynx	*Felis lynx*, Tem.
Wild cat	*F. catus ferus*, L.
Wolf	*Canis lupus*, L.
Fox	*C. vulpes*, L.
Marten	*Mustela martes*, L.
Ermine	*M. erminea*, L.
Stoat	*M. putorius*, L.
Otter	*Lutra vulgaris*, Erxl.
Brown bear	*Ursus arctos*, L.
Grisly bear	*U. ferox*, Lew and Clark.
Badger	*Meles taxus*, L.
Horse	*Equus caballus*, L.
Bison	*Bison Europæus*, Gm.
Urus	*Bos* (*Urus*) *primigenius*, Boj.
Saiga antelope	*Antilope saiga*, Pall.
Stag	*Cervus elaphus*, L.
Roe	*C. capreolus*, L.
Fallow deer	*C. dama*, L., var. *C. Browni*, Dawk.
Wild boar	*Sus scrofa ferus*, L.

The last and most important addition to be made to

this list is the man of the river deposits, or the River-drift man, who differs, as we shall presently see, both in culture and in range, from the man of the caverns.

Incoming Arctic Species.

The third group to be considered consists of living species of northern habit (see Fig. 24).

Incoming Living Species of Northern Habit = 8.

Russian vole . .	*Arvicola ratticeps*, Keys-u-Blas.
Norwegian lemming	*Myodes torquatus*, Pal.
Arctic lemming .	*M. lemmus*, L.
Varying hare . .	*Lepus variabilis*, Pal.
Musk sheep . .	*Ovibos moschatus*, Desm.
Reindeer . . .	*Cervus tarandus*, L.
Arctic fox . .	*Canis lagopus*, L.
Glutton . . .	*Gulo luscus*, L.

The arctic lemming, an inhabitant of the circumpolar regions of Asia and America, and not found farther south in the latter continent than Unalaska in N. lat. 54°, lived in the Pleistocene age as far to the south as Quedlinburg in Saxony, and the valley of the Loire in France, and as far to the west as the caverns of the Mendip Hills; while the allied Norwegian species, now restricted to the Scandinavian peninsula and Russian Lapland, ranged as far south into Germany as Saxony, and into England as Somerset. The Russian vole, also, of Scandinavia, Lapland, northern Russia, and Kamtchatka, then lived in Somersetshire; and the varying hare (= the Irish hare = blue hare of Scotland), of the cold hilly districts of Britain and of the continent, as well as northern Europe and Asia as far as the Arctic Sea, has been discovered in the caverns of Suabia (Fraas) and Switzerland (Mawdach).

At the present time the musk sheep, the elegant white arctic fox, the reindeer, and the glutton or wolverine (Fig. 21), live side by side in circumpolar America, and the three last range over the far north of Asia and Europe, the glutton, according to Zimmermann, having been caught as far south as Brunswick and Saxony. Of these the first two have been met with as far to the

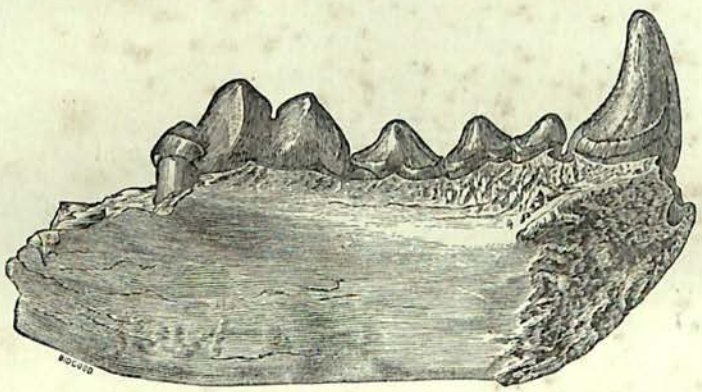


FIG. 21.—Lower Jaw of Glutton, Plas Heaton Cave, ½.

south-west as the Pyrenees; the third as far to the south as Switzerland; and the fourth as far to the west as the caves of Somersetshire, and to the south as Auvergne (E. Lartet).

To this division also must be added the Cave-man, who, as we shall see in the seventh chapter, is represented at the present time by the Eskimos, and differed from the Palæolithic man of the river deposits probably in race, and certainly in culture.

Incoming Species now restricted to Cold Mountainous Regions.

The preceding group of animals now living in an arctic climate was associated in Pleistocene Europe

with those which enjoy the cold climate of the mountains not far removed from the snow line, viz.—

Snowy vole . .	*Arvicola nivalis*, Martins.
Alpine marmot .	*Arctomys marmotta*, Schreb.
Chamois . .	*Antilope rupricapra*, Pal.
Ibex . . .	*Capra ibex*, L.

The first of these, now not found at a lower level than 3000 feet above the sea in the Alps, has been discovered by Dr. Forsyth Major at Levrange in Lombardy.[1] The second, now haunting the higher Alps, Pyrenees, and Carpathians, in the Pleistocene ranged from the shores of the Mediterranean (Mentone) as far north as Belgium (Trou de Magrite, Dupont). The third, the chamois of the Alps, the izard of the Pyrenees, the steinbock of the Carpathians and the Caucasus, lived on the banks of the Meuse, the region drained by the Loire, and in Suabia; while the fourth, the bouquetin or ibex of the Alps, Carpathians, and Sierra Nevada in Spain, was found alike in Gibraltar (Busk), southern and central France (Mentone, Auvergne), Belgium, and Suabia (Fraas). The last species is probably identical with the *Capra beden* of Crete, of the Cyclades, of Syria, and of north-eastern Africa, as well as with the *C. Sibirica* of the Altai and Thibet, all of which appear to be varieties brought about by insulation of the breeds from each other.

In the Pleistocene age the ibex ranged from the border of the Mediterranean northwards over Spain, France, and Germany; and it would have free access to North Africa, the sea bottom in the Straits of Gibraltar then being a valley lifted up above the level of the sea (see Map, Fig. 24), as well as to Crete and the Cyclades, which were then

[1] *Atti Soc. Tosc. Sc. Nat.*, Nov. 1876.

lofty mountains overlooking the land connecting Asia Minor with Greece. When the present geographical and climatal conditions were brought about, the ibexes would naturally take refuge in the mountains, and in the long course of ages would be very likely to present those minute and unimportant varieties which are seen in wild isolated breeds. It must further be remarked, that although the ibex ranged as far south as Crete and the Atlas, the mountains of the former are covered with snow as late as the middle of June,[1] and the climate of the latter has been sufficiently severe in ancient times to allow of glaciers extending down their flanks to within 6000 feet of the present level of the Mediterranean. When Morocco and the Grecian archipelago were lifted high above the present level of the sea—not less, as I have pointed out in my work on *Cave-hunting*, than 2400 feet (400 fathoms)—the climate would be far more severe than it is at present, and the ice and snow probably formed snow-fields and glaciers like those of the high Alps.

Incoming Species now found in Hot Climates.

The animals passed under review in the above pages inhabit, as we have seen, the temperate and cold regions of Europe, Asia, and America. The next division which comes before us has its headquarters in hot climates. It consists of the

Porcupine . . .	*Hystrix dorsata*, L.
Lion	*Felis leo*, L.
Leopard or Panther .	*F. pardus*, L.
African lynx . .	*F. pardina.*

[1] I saw the top of Mount Ida covered with deep snow in June 1875.

Caffer cat . . .	*F. caffer Desm.* = *F. caligata Tem.*
Spotted hyæna . .	*Hyæna crocata*; Zimm, var. *spelæa.*
Striped hyæna . .	*H. striata*, Zimm.
African elephant . .	*Elephas africanus*, Blum.

The porcupine of northern Africa and the warmer European districts of the Mediterranean, as well as of Asia Minor, lived in the Pleistocene age as far north as the banks of the Meuse.[1] The leopard or panther, common to Africa and the warmer regions of middle and northern Asia, also ranged through Europe as far to the north-west as the Mendip Hills (see Fig. 24). The discovery of its remains in the caves of Gibraltar, France, and Germany, proves that in the Pleistocene age it passed over into Spain, France, and Saxony, just as those in the Mendip caves show that it passed northwards over the area of the Channel, to prey upon the reindeer, bisons, and horses of Somersetshire.[2] It was very rare as compared with the other carnivores of the period—lions, bears, and hyænas—and it was associated in its wanderings with the feline now found throughout Africa—the Caffer cat.[3] The lynx of northern Africa, Spain, Sardinia, Sicily, and the Levant, has been discovered in the caves of Gibraltar. The lion, now found only in the warm climates of Africa and southern Asia, hunted its prey as far north as Yorkshire (Kirkdale), and as far to the north-east as the frontiers of Poland. The spotted hyæna now lives only in Africa, south of the Sahara Desert: then it abounded in Spain, France, Germany, and in Britain, as far north as the vale of

[1] Schmerling, *Recherches sur les Oss.-Foss., decouverts dans les Cavernes de la Province de Liège*, 4to, 1833-34.

[2] Dawkins and Sanford, *British Pleistocene Mammalia. Palæont. Soc.*, 1871. Part IV.

[3] *Op. cit.* Part III.

Pickering, as well as in southern Russia, as far to the east as the region of the Altai (Brandt). The striped hyæna of Africa, and the warmer climates of Asia, dwelt in the Lunel-viel[1] in Provence, and the African elephant, now no longer found north of the Sahara, then passed from the present coast of Africa northwards to Sicily,[2] and in Spain as far as the latitude of Madrid.

Incoming Extinct Species.

The above species, with the exception of some of the survivals of the Pleiocene age, are alive in some part of the world. With them are associated others which have become extinct.

Cuvier's beaver	*Trogontherium Cuvieri*, Ow.
Gigantic dormouse	*Myoxus Melitensis*, Falc.
Pouched marmot[3]	*Spermophilus erythrogenoides* (?), Falc.
Straight-tusked elephant	*Elephas antiquus*, Falc.
Mammoth	*E. primigenius*, Blum.
Falconer's elephant	*E. Falconeri*, Busk.
Pigmy elephant	*E. melitensis*, Falc.
	E. mnaidrensis, Adams.
Woolly rhinoceros	*Rhinoceros tichorhinus*, Cuv.
Small-nosed rhinoceros	*R. leptorhinus*, Ow.
Deer of the Carnutes	*Cervus Carnutorum.*
Thick-antlered deer	*C. verticornis*, Dawk.
Irish elk	*Megaceros hibernicus*, Owen.
Pigmy hippopotamus	*Hippopotamus Pentlandi*, Falc.
Cave bear	*Ursus spelæus*, Goldf.

Among the rodents the large extinct beaver, and among the deer the *Cervus Carnutorum* and the *C.*

[1] Marcel de Serres, *Mem. du Mus.*, xvii. Pl. 25.

[2] Falc., *Palæont. Memoirs*, ii. p. 283.

[3] This is separated from the living *S. erythrogenys* by Dr. Falconer, but it is by no means certain that it belongs to an extinct species.

FIG. 22.—Mammoth engraved on Ivory by Cave-man, La Madelaine.

verticornis, are found in Britain and France, the giant dormouse and the three kinds of pigmy elephant in Malta.

The mammoth[1] (Fig. 22) is very abundant in the caverns and river deposits of Britain and of France, and is known to have ranged over the Pyrenees into Spain, from the discovery of specimens in the zinc-mines of Santander. It has been proved by Prof. E. Lartet and Dr. Falconer to have lived in the neighbourhood of Rome at a time when the volcanoes of central Italy were active, and poured currents of lava and threw clouds of ashes over the site of the imperial city. It is common in northern and southern Germany, but it has not been found in Europe north of a line passing through Hamburg, or in any part of Scandinavia or Finland. It occurs in the auriferous gravels of the Urals; and in Siberia, as is well known, it formerly existed in countless herds, being buried in the morasses in large numbers, in the same manner as the Irish elks at the bottom of the Irish peat-bogs. The admirable preservation of some of the carcases is undoubtedly due to their having been entombed directly after death, and then quickly frozen up, a process which need not necessarily imply climatal conditions unlike those of the present time in Siberia. In unusually hot spring times, the warm waters borne down by the great rivers from their southern feeders thaw the frozen morasses with incredible rapidity, so that the hard ice-bound "tundra" becomes quickly converted into a treacherous bog. In the exceptionally warm season of 1846, the mammoth discovered by Lieut. Benkendorf on the banks of the Indigirka was thawed out of the tundra until it was revealed to the astonished eyes of the beholder, standing on its feet in the position in which it had been bogged. Had any elks or reindeer been on

[1] See Dawkins, *Quart. Journ. Geol. Soc. Lond.*, XXXV. 138, for the references to the range of the mammoth.

that spot at that time they might have been entombed in the same way, and preserved by the frosts of the winter till they were liberated again by the rare chance of their place of sepulture being invaded by warm floods from the south. The thaw in that year proceeded so rapidly that Lieut. Benkendorf and his Cossacks narrowly escaped the alternative of being entombed in the soft morass, or of being swept out northwards into the Arctic Sea, as his mammoth was, to join the vast assembly of mammoths and reindeer and other animals which have been swept down in a similar fashion.

The remains of the animal occur throughout Russian Asia; and the singular notice of fossil ivory being brought for sale to Khiva, by an enterprising Arabian traveller, Abou-el-Cassim, in the middle of the tenth century, applies to the mammoth ivory from the old Bulgaria on the Lower Volga.

We learn from the recent researches of M. Chabas that an elephant was living in the valley of the Euphrates in the sixteenth century B.C., when that district was invaded by the Egyptians, since a great hunting of elephants by the Pharaoh Thothmes III. in the neighbourhood of Nineveh has been recorded in an Egyptian inscription. This important notice shows that the fossil and living elephants of Asia in ancient times were not separated from each other by impassable geographical barriers or wide spaces of mountain and desert. Those hunted may have been either the fossil (*E. armeniacus*) Armenian, or the Indian species.[1] On taking a survey of the whole evidence as to the range of the mammoth

[1] Chabas, *Études sur l'Antiquité historique d'après les sources égyptiennes*, 2d edit., p. 124. It must be remarked that this notice stands alone, and is as yet not confirmed by any Assyrian or Babylonian records.

and its relation to the Indian elephant, it appears to me very probable that they are two well-marked varieties rather than two extinct species, and that the latter has derived those trifling characters by which it is distinguished from the former in the untold ages of its sojourn in the tropical forests of India. The possession of hair and wool so remarkable in the Siberian mammoth

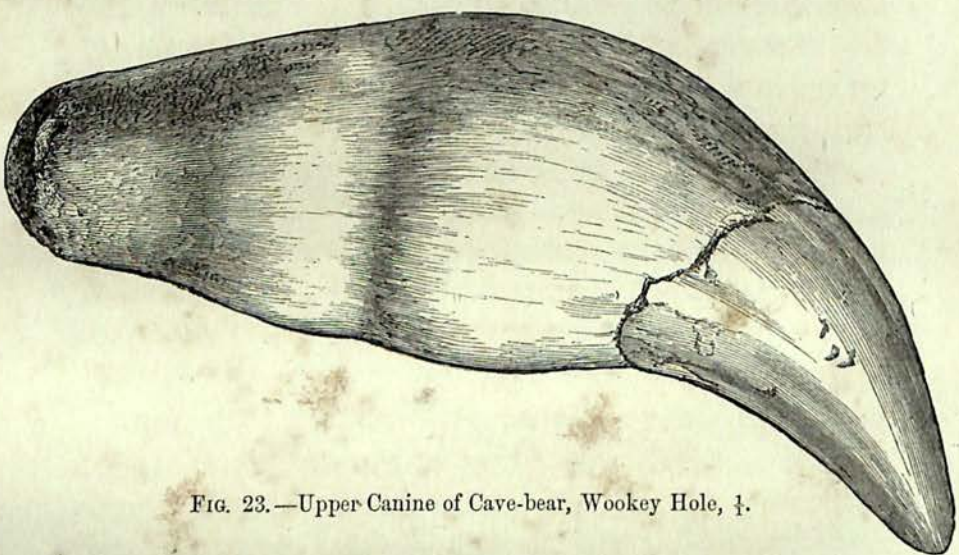


FIG. 23.—Upper Canine of Cave-bear, Wookey Hole, ¼.

depends mainly upon the climate, and cannot therefore be taken to be a specific character. It is very probable that the mammoth in Italy, and in the districts bordering on the Gulf of Mexico, presented as great a contrast in those respects with the mammoth of the north as the Thibetan mastiff and goat, which lose their fine wool when brought down from the Himalaya to Kashmir.[1]

The mammoth was accompanied in its wanderings from the high northern latitudes of Asia by the woolly

[1] Falconer, *Nat. Hist. Rev.*, 1862, p. 113. On the variability in the development of hair and wool, see Darwin, *Variation under Domestication*, ii. p. 278.

rhinoceros as far as the Alps and the Pyrenees. A straight-tusked elephant abounded in Italy, and is found through France and Britain as far north as Yorkshire, being very generally associated with a southern form of rhinoceros, the small-nosed species of Professor Owen. The gigantic Cave-bear (Fig. 23) haunted the caves of Italy, France, and Britain, as well as those of Germany; while the Irish elk fell a prey to the hyænas in all these countries, and was found as far to the east as the mountains of the Altai. The pigmy hippopotamus, on the other hand (*H. Pentlandi*), like the living dwarf species of Africa, has a comparatively restricted range, being found in Sicily, Malta, and Crete, and on the mainland of the Peloponnese at Megalopolis.

These groups of animals, man being omitted, stand to each other in the following relation :—

Survivals from Pleiocene—	
Living species	1
Extinct	7
New Living Species—	
Temperate	34
Northern	8
Of Mountains	4
Of Hot Countries	8
New Extinct Species	15
Total	77

Evidence from Distribution of Animals as to European Geography.

This remarkable association of animals in Pleistocene Europe, some of which are now only alive in widely

remote parts of the world, points with unerring certainty to great geographical and climatal changes. Nearly all the temperate, northern, and mountainous species can be traced to northern and central Asia, and for their migration it is necessary to suppose that a very close connection with Asia was caused by the elevation of land at the close of the Pleiocene age.

This, probably, is indicated by the low tract of country uniting the northern end of the Caspian with the Sea of Aral, and reaching through the salt steppes of Ishim into the valley of the Irtisch, and thence to the Gulf of Obi and the Arctic Sea. Britain also formed part of the mainland, and the bottom of the Pleiocene sea (Fig. 10) became the feeding-grounds of the animals which have left their remains in the forest bed of Norfolk and Suffolk, as well as in the Dogger Bank off Yarmouth. Ireland also must have been united to Britain to have allowed of their finding their way so far to the west. The elevation above the present sea-level, necessary to account for this distribution of the animals, is not less than 600 feet or 100 fathoms. At this depth the soundings show the presence of a line of submarine cliffs which form the margin of the plateau of the British Isles, and which mark the probable Atlantic coast-line of north-western Europe, during a large part of the Pleistocene age, as represented in the accompanying map (Fig. 24).[1]

The invasion also of Europe by southern animals, whose headquarters are in Africa, proves an intimate connection between the two continents. The Straits of Gibraltar could not have been in existence when the African elephant ranged as far north as Madrid, and the

[1] Dawkins' *Cave-hunting*, p. 362 *et seq.*

Caffer cat and African lynx and spotted hyæna sought their prey in the Iberian peninsula. Nor could Sicily

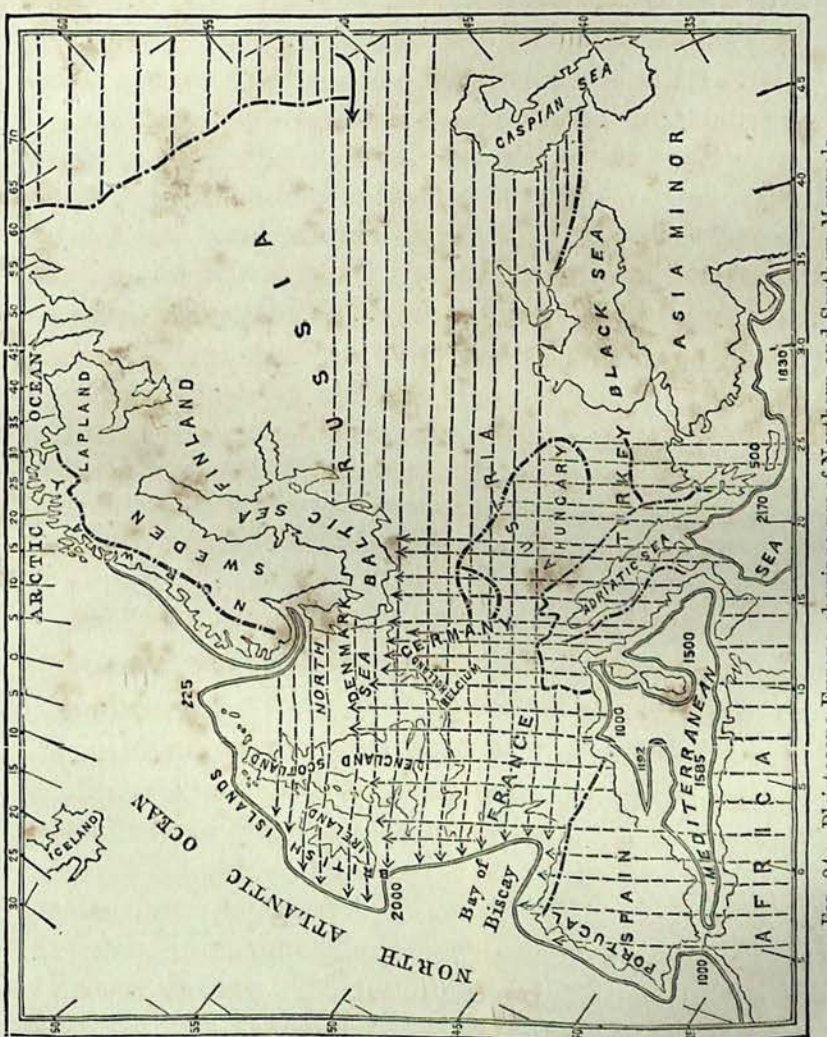


FIG. 24.—Pleistocene Europe, showing range of Northern and Southern Mammals.

have been separated from Africa on the one hand and Italy on the other, when the African elephant lived on that island, and the striped hyæna passed into the south of

France. Malta, Sicily, and Crete must have been the higher portions of a continent, now submerged, when the pigmy hippopotamus lived in all three; and the Apennines, the mountains of Sardinia, Greece, Asia Minor, and the Atlas, must have been connected by land with the mountains of Crete and the Cyclades to allow of the distribution of the living ibexes. For all these animals to have arrived at the places where they are found, it is necessary that the whole Mediterranean area should be lifted up 400 fathoms above its present level, which would result in its being reduced to the two deep land-locked seas of Fig. 24, divided from each other by the belt of land reaching from Cape Bon (Tunis) to Malta, Sicily, and Calabria. It may further be remarked that, while a large portion of the present Mediterranean was dry land, the Sahara was occupied by a prolongation of the Atlantic far into the region south of the Atlas mountains.[1]

From these considerations it is evident that Pleistocene Europe must be looked upon as intimately connected with Africa on the south and with Asia on the east, and that it offered no barriers to the migration of Asiatic and African animals as far to the west as Britain and Ireland.

Evidence as to Climate.

The range of the northern and southern mammalia over Pleistocene Europe is indicated respectively by the horizontal and vertical dotted lines in the above Map (Fig. 24), and from their examination it will be seen that Europe is divided into three distinct zones; 1st, the northern, into which the southern animals never pene-

[1] For proof of this see *Cave-hunting*, chap. x.

trated, comprising the region north of a line passing from Yorkshire eastwards through Hamburg and Russia; 2d, the middle zone, common to both groups of animals, extending south of this line as far as the Pyrenees, the Alps, and Hungary; and lastly, the southern, into which the northern animals never penetrated, or Spain, Italy, and Greece. It must further be observed that the range of the mountainous species, such as the ibex, into the region of the southern animals—into the Apennines, the Sierra Nevada—the Atlas, and the mountains of Sardinia, of Crete, and Anatolia,—shows that the distribution of the Pleistocene mammalia was regulated by climate rather than by physical barriers.

From this distribution we may infer that the climate was severe in the north and warm in the south, while in the middle zone, comprising France, Germany, and the greater part of Britain, the winters were cold, and the summers warm as in middle Asia and North America, where large tracts of land extend from the Polar region towards the equator, and offer no barrier to the swinging to and fro of the animals. In the summer time the southern species would pass northwards, and in the winter time the northern would swing southwards, and thus occupy at different times of the year the same tract of ground, as is now the case with the elks and reindeer.

It must not, however, be supposed that the southern animals migrated from the Mediterranean area as far north as Yorkshire in the same year, or the northern as far south as the Mediterranean. There were, as we shall see presently, secular changes of climate in Pleistocene Europe, and while the cold was at its maximum the arctic animals arrived at the southern limit, and while it was at its

minimum the spotted hyæna and hippopotamus and other southern animals roamed to their northern limit. Thus every part of the middle zone has been successively the frontier between the northern and southern groups, and consequently their remains are mingled together in the caverns and river deposits, under conditions which prove them to have been contemporaries in the same region. In some of the caverns, such as that of Kirkdale, the hyæna preyed upon the reindeer at one time of the year and the hippopotamus at another. In this manner the association of northern and southern animals may be explained by their migration according to the seasons, and their association over so wide an area as the middle zone by the secular changes of climate, by which each part of the zone in turn was traversed by the advancing and retreating animals.

Climatal and Geographical Changes in Britain marked by Glacial Phenomena.

Secular changes of climate in the Pleistocene age are clearly marked in Britain north of a line connecting the Bristol Channel with the valley of the lower Thames, and passing due eastward into Germany and Russia, by the traces of glaciation, by the erratics, or blocks of stone transported far away from the rocks from which they were torn, and by the accumulations of clay and sand known as the glacial[1] drift. They imply the following

[1] The term glacial, used in a varying sense by different writers, is employed in these pages merely to express the marks of the presence of ice in the shape of glaciers and icebergs in the areas where they are no longer found. For purposes of geological classification over wide areas an appeal to the purely local phenomena of glacier or iceberg is useless,

series of climatal and geographical changes, affecting the area of Britain north of the above line, those which are purely local being omitted.

1. *The First Glaciation a Period of Elevation.*

At the beginning of the Pleistocene age the temperature was lowered in northern Asia and Europe, and ultimately became sufficiently severe to allow of glaciers descending from the hills in Britain and Ireland, and covering large tracts of the lower grounds, like the confluent glaciers concealing a large portion of Greenland. One of these systems of glaciers covered the greater part of Scotland, another the mountains of Cumberland and Westmoreland, a third the Pennine chain, and a fourth the greater part of Wales, and they have left their marks behind in all these districts in the ice-moulded contours of the hills, and in the grooves cut in the

because they tell us nothing as to the contemporary fauna and flora, by which alone all geological periods have hitherto been determined. I am unable, therefore, to agree with Dr. James Geikie in treating the Pleistocene period as the equivalent of "the Ice age."

It is foreign to the plan of this work to discuss the much debated cause of the Glacial period, as the lowering of the temperature in the Pleistocene age is frequently termed. Was it due to a change in the oceanic currents? or to a movement in the axis of the earth? or to a variation in the heating power of the variable star on which our universe depends? The question opens a vast field for speculation, on which the reader may consult Dr. Croll's *Climate and Time*, Sir John Lubbock's *Prehistoric Times*, and Sir Charles Lyell's *Antiquity of Man*.

The best account of the complex phenomena of the Glacial period is to be found in Lyell's *Antiquity of Man*, 4th edit. c. xii.-xviii. See also *The Great Ice Age* of Dr. James Geikie, as well as the essays of Jamieson, Searles Wood, Harmer, Hull, De Rance, and others, in the *Geological Magazine*, the *Quarterly Journal of the Geological Society*, and the *Memoirs of the Geological Survey*.

rocks. In some cases, as near Liverpool, these grooves are found near the present sea-level, and in others they pass far below it. It is very probable that the ice may have arrived at the Atlantic shore at a considerable distance from the present coast-line, and that it may have been continuous with that of Scandinavia, where similar traces have been met with.

The ice at this time was sufficiently thick to override Schihallion in Perthshire at a height of 3500 feet,[1] and the hills of Galway and Mayo at 2000 feet.[2] Its southern limit in Britain is uncertain. According to Professor Ramsay and Dr. James Geikie it extended as far south as the latitude of London: but the hypothesis upon which this southern extension is founded — that the boulder clays have been formed by ice melting on the land—is open to the objection that no similar clays have been proved to have been so formed, either in the Arctic regions, where the ice-sheet has retreated, or in the districts forsaken by the glaciers in the Alps or Pyrenees,[3] or in any other mountain chain. Similar deposits, however, have been met with in Davis Straits and in the North Atlantic, which have been formed by melting icebergs, and we may therefore conclude that the boulder clays have had a like origin.

To this ice-sheet may be referred the groovings in the rocks underlying the lowest boulder clays of Britain and Ireland, as well as the lines of erratics which sometimes can be traced in directions not coinciding with the present valleys, as, for example, those at Norber, near

[1] Jamieson, *Quarterly Journal of Geological Society, Lond.*, xxi. p. 165.

[2] Kinahan and Close, *General Glaciation of Iar-Connaught and its Neighbourhood*, Dublin, 1872, p. 16.

[3] See Bonney, *Geological Magazine*, ii. Vol. iii., "Some Notes on Glaciers."

Ingleborough, in Yorkshire. The tough clays with scratched stones, sometimes so hard to work that it is necessary to employ gunpowder, are considered by Dr. James Geikie to be the *débris* underneath the ice-sheet accumulated on land, and termed by the Swiss geologists "*moraine profonde.*" These are met with chiefly in Scotland, but they have been observed by Mr. De Rance in South Lancashire, and at the Little Ormes Head in North Wales.

The climate must have been arctic in its severity during this period of glaciation, and this may have been partially due to the fact of the land standing at a higher level above the sea, and being lifted up into the colder regions of the atmosphere. It cannot, however, be wholly so explained, since it was the culmination of a series of changes by which the tropical climate of the Eocene passed into the warm Meiocene and temperate Pleiocene climates.

2. *The Icebergs—a Period of Depression.*

Then followed a period of depression beneath the sea. The glaciers, which had before carried their burdens of sand, clay, and stone far away from the present seaboard of Britain,[1] now ended at the retreating shoreline, giving rise to icebergs, which deposited the lower boulder clay as they melted, and drifted as far to the south as the valley of the Thames. The mountains were

[1] The English boulder clays, as a whole, differ from the *moraine profonde* in their softness and the large area which they cover. Strata of boulder clay at all comparable to the great clay mantle covering the lower grounds of Britain north of the Thames are conspicuous by their absence from the glaciated regions of central Europe and the Pyrenees, which were not depressed beneath the sea.

reduced to clusters of glacier-covered islands rising from the sea, which, in Lancashire and Yorkshire, was not less than 300 feet above its present level. The drift of the icebergs at this time was mainly in a south-easterly direction, as is indicated by rocks derived from Cumberland, Westmoreland, and perhaps Scotland, and dropped, as they melted, over Lancashire, Cheshire, and Shropshire.[1]

3. *The Depression continued. Climate Temperate.*

At the close of this period the climate grew warmer, and banks of shingle and sand were accumulated, instead of boulder clays, constituting "the Middle drift sand and gravels." The glaciers disappeared, and the sea beat upon an archipelago of islands,[2] which gradually sank beneath the sea to a depth of from 2300 feet below their present level on the flanks of Snowdon, to 1200 feet at Vale Royal, on the road between Buxton and Macclesfield, and to about 1400 feet in Scotland. And as this took place, the sands and shingle gradually arrived at those altitudes, resting on the lower boulder clay in the lower and on the glaciated surface of the older rocks in the higher, grounds. The climate may be inferred to have been temperate, not merely from the absence of icebergs, but from the presence of mollusca now living in the adjacent seas.

[1] For the geography of Britain at this time, see Lyell, *Antiquity of Man*, Fig. 43.

[2] See Lyell, *Antiquity*, Fig. 42.

4. *A Reversion to a Severe Climate.*

The next change was one of climate, which reverted to the cold condition of the second of these divisions. Glaciers again covered the higher grounds, and icebergs again floated over the lower grounds, still submerged, depositing as they melted the upper boulder clay, which rises as high as 500 feet above the sea-level in Lancashire and Yorkshire (Hull). The drift of the icebergs was south-easterly, since the peculiar altered chalk of Antrim, in the north of Ireland, is scattered over Lancashire and Cheshire, and as far south as Ironbridge in Shropshire.

5. *Period of Elevation—Climate becoming Temperate.*

Then followed an upward movement of the land, until the upper boulder clay became dry land, and Britain and Ireland became part of the mainland of Europe, as is represented in the Map (Fig. 32). Glaciers still remained on the higher hills in Scotland, Wales, and Cumbria, leaving in their retreat the old moraines, so conspicuous in those regions. The climate was less severe than in the preceding period, and was gradually again becoming temperate. As the upper boulder clay deposited on the sea-bottom became lifted up, it was gradually covered by forests of yew, Scotch fir, oak, ash, and alder, in which the Pleistocene mammalia found ample food in the eastern and midland counties.

Climatal Change on the Continent, and in Asia and Africa.

Similar climatal changes have left their mark upon the higher mountains of Europe, Asia Minor, and North

Africa. During the period of maximum cold, the glaciers of Auvergne joined those of the Jura, in the valley of the Rhone, and those of the Alps extended far down into Lombardy, France, Switzerland, and Germany. From the Pyrenees, also, glaciers found their way as far as Toulouse, and from the snowy tops of the Atlas and of the Lebanon they descended to the level of 6000 feet, and from the mountains of Lazistan to that of 4500 feet above the sea.[1]

This period of maximum cold in the south of Europe coincided with a period of high elevation, in which the Mediterranean area was lifted up not less than 2400 feet above the sea, so as to allow of Europe joining Africa by way of Gibraltar and of Sicily and Malta, as we have seen in this chapter. The Alps also, at the beginning of the Pleistocene, according to Professor Gastaldi, stood 1312 feet higher than they were in the Pleiocene age.[2]

Variation of Climate in the Alps.

These climatal changes are traceable in the Alps by the advance and retreat of the glaciers, and in some Alpine districts there is evidence of a reversion to a temperate climate. On the borders of the lake of Zurich, for example at Utznach and Dürnten, a bed of lignite intercalated between two glacial accumulations proves that a forest occupied the same tract of ground which before and after was covered by a glacier.[3]

[1] See Dawkins' *Cave-hunting*, p. 382 *et seq.*

[2] *Atti della Reale Accademia delle Scienze de Torino*, vol. x. 21.

[3] Heer, *Primeval World in Switzerland*, ii. p. 149

Relation of Mammalia to Glacial Phenomena.

The complicated glacial phenomena summed up in the preceding pages imply not merely a change from a temperate to a cold climate of extreme severity, but they show a climatal fluctuation of the sort which might be expected from the examination of the Pleistocene mammalia. When the reindeer inhabited the south of France the cold was at its maximum, and when the hippopotamus lived in England the cold was probably at its minimum. Each of these changes was probably brought about during a long series of ages, and each has left its mark in the mixed fauna of the middle zone of the map (Fig. 24).

The lowering of the temperature was probably the cause of the immigration into Europe of the Asiatic species. As the cold increased in Asia, and the warm Pleiocene climate of northern and central Europe gradually became cool, the animals which had been living in Asia for an unknown series of years poured in, a way being opened to them by the elevation of a low-lying tract of land at the head of the Caspian and the Gulf of Obi, which had probably hitherto been the bottom of a shallow sea cutting them off from Europe. It must be remarked that a change towards cold conditions has already been indicated by the ice-borne blocks of stone met with on the Pleiocene sea-shore of Suffolk. A vast migration of animals set in from Asia, analogous in every respect to that by which the European peoples arrived at their present homes, and following for the most part the same route, between the Caspian Sea and the Ural mountains (see Fig. 24, p. 111).

The Three Divisions of the Pleistocene Age.

As the climate in Europe changed, the Pleiocene species yielded place to those which were better adapted to the new conditions, either retreating southwards or becoming extinct. The first division of the Asiatic invaders is composed of the animals forming the temperate group above mentioned; they are found in the early Pleistocene strata, in Britain and in France, side by side with the survivals from the Pleiocene age. No arctic mammalia had as yet arrived. The next stage in the migration is that in which the temperate group of animals had for the most part replaced the Pleiocene survivals, in Britain and France, and the arctic mammalia begin to appear, but only in small numbers. This constitutes the middle Pleistocene division. The third stage in the migration is indicated by the presence in full force of the arctic species in the area north of the Alps and Pyrenees. They are not, however, met with south of this boundary, and therefore this classification does not apply to the deposits of Spain, or the other portions of the southern zone.

It must also be noted that the temperate group of the Asiatic invaders found their way over the whole of southern Europe, and along the Mediterranean shores, as far south as Palestine and the Sahara Desert—Sicily and Malta affording one line of migration southwards, and the land barrier then stretching across the Straits of Gibraltar offering another.

Pleistocene Mammalia in Britain before, during, and after the Glacial Period.

The Pleistocene mammalia might reasonably be expected, from the manner in which the Asiatic migration took place, to have been in Europe before, during, and after the Glacial period. As the ice advanced southwards it pushed the arctic mammalia southwards, and caused them to encroach on the temperate and southern mammalia. When it retreated northwards the animal life swung northwards. These considerations, necessary from the facts brought forward in the preceding pages, will be found in the next chapter to be proved by a critical examination of the river deposits and the contents of caverns.

From the large percentage of living species which we have noted in the preceding chapter, we might have inferred that the time was at hand for the arrival of man. The greater part of the living European mammalia were present, and the world was then in the stage of evolution in which man might be expected to play his part. In the next two chapters we shall see at what stage of the Pleistocene age he appears, and we shall examine the evidence from which it may be concluded that there were two races — the River-drift men and the Cave-men—in Europe during the long series of ages represented by the Pleistocene period.

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CHAPTER VI.

THE RIVER-DRIFT HUNTER OF THE PLEISTOCENE AGE AND HIS SURROUNDINGS.

Great Britain in the Early Pleistocene Age.—Early Pleistocene Forests in Britain.—Mammalia inhabiting Early Pleistocene Forests.—Physical Relations of Forest Bed.—Early Pleistocene Forests in France.—Presence of Man in Early Pleistocene Strata doubtful.—The Mid-Pleistocene Mammalia.—Evidence of the Presence of Man.—The Arctic Mammalia present.—Physical Relations of Mid-Pleistocene Strata.—Level not an absolute Test of Age.—Mid-Pleistocene Caverns.—The Lignite Beds of Dürnten present no Traces of Man.—The Late Pleistocene Mammalia.—Mammals found in Late Pleistocene River-Strata and Caverns in Britain.—The Late Pleistocene Geography.—The Range of the Late Pleistocene Mammals over Britain and Ireland.—The Late Pleistocene River Deposits.—The Reindeer-Ford at Windsor.—Palæolithic Implements in the Valley of the Thames.—River-drift Man in the Neighbourhood of Salisbury.—Social Condition of the River-drift Man.—His Range on the Continent.—Present in Palestine and India.—Relation to the Glacial Period.—General Conclusions as to the River-drift Man.

Great Britain in the Early Pleistocene Age.

In the Pleiocene age the North Sea extended, as we have shown in Fig 10, over a large part of Norfolk and Suffolk. At its close this area was lifted up above the waves, and probably the greater part of it became dry land, over which the early Pleistocene mammalia roamed with complete freedom, leaving their remains in the

river deposits, to be dredged up by the fishermen of the present time in the North Sea in incredible numbers. Our western seaboard then was probably marked by the hundred-fathom line, sweeping far to the west and north of Ireland, and southwards across the mouth of the Channel. In all probability the geographical conditions of Britain at this time were identical with those of the late Pleistocene (see Fig. 32, p. 150), when our country formed part of the continent.

Early Pleistocene Forests.

The early Pleistocene vegetation covering Britain is represented by the specimens collected by the Rev. S. W. King, in 1861, from the forest bed and lignite beds of the Norfolk shore, and identified by Professor Heer. The forests then growing in the area of the North Sea consisted of Scotch firs, spruces and yews, oaks and birches, with an undergrowth of sloes. In the marshes there were alders, osmund royal, and marsh trefoil; the rivers were gay with the blossoms of the yellow and white water-lilies; and in the pools there were horn-worts and pond weeds. In this list, as Sir Charles Lyell remarks, only one species, the spruce, is not now indigenous in Britain. The history of the arrival of this tree in Europe is very remarkable. Professor Heer, in his description of the fossil plants discovered in Grinnell Land by Captain Fielden, describes the spruce among the Meiocene plants of the Arctic region. "We therefore see that our spruce was living during the Meiocene period in Grinnell Land as well as in North Spitzbergen, and at that time doubtless extended as far as the Pole, at least if any dry land then existed there. In Europe the

tree did not then exist; hence very probably it had its original home in the extreme north, and has since extended southwards. We first meet it in Europe in the forest bed of the Norfolk coast, and in the interglacial lignites of Switzerland. At that time, therefore, it had come into our regions, and has ever since formed a principal constituent of our forests. Its extreme northern limit is now in Scandinavia, latitude 69½° N.; and it is now spread over about 25° of latitude, whilst during the Meiocene period it was limited to the Arctic zone."[1]

Mammalia inhabiting Early Pleistocene Forests.

If the reader could have penetrated these forests of the North Sea, he would have found himself in the midst of a group of animals of very singular character. Were he conversant with those of the Pleiocene age, he would have recognised the following species:—Two kinds of elephants, both of gigantic size (*E. antiquus* and *E. meridionalis*), two kinds of rhinoceros (*R. etruscus* and *R. megarhinus*) from time to time would have appeared before him, and he would have had to guard himself against the attacks of the sabre-toothed lion (*Machairodus*) and the bear of Auvergne. He might have hunted Sedgwick's deer, an animal with wonderfully complex antlers (identical with the *C. dicranios* of Nesti, of the Val d'Arno (Fig. 16), as well as the deer of Polignac), and on the sides of the rivers he might have seen the African hippopotamus. All these species are to be looked upon as survivals from the preceding

[1] *Quart. Journ. Geol. Soc. Lond.* xxxiv. p. 68.

period, and, with the exception of the last, none are now living on the earth.

He would also have seen animals unknown in the Pleiocene age, some extinct, while others now form part of the fauna of temperate Europe and Asia. To

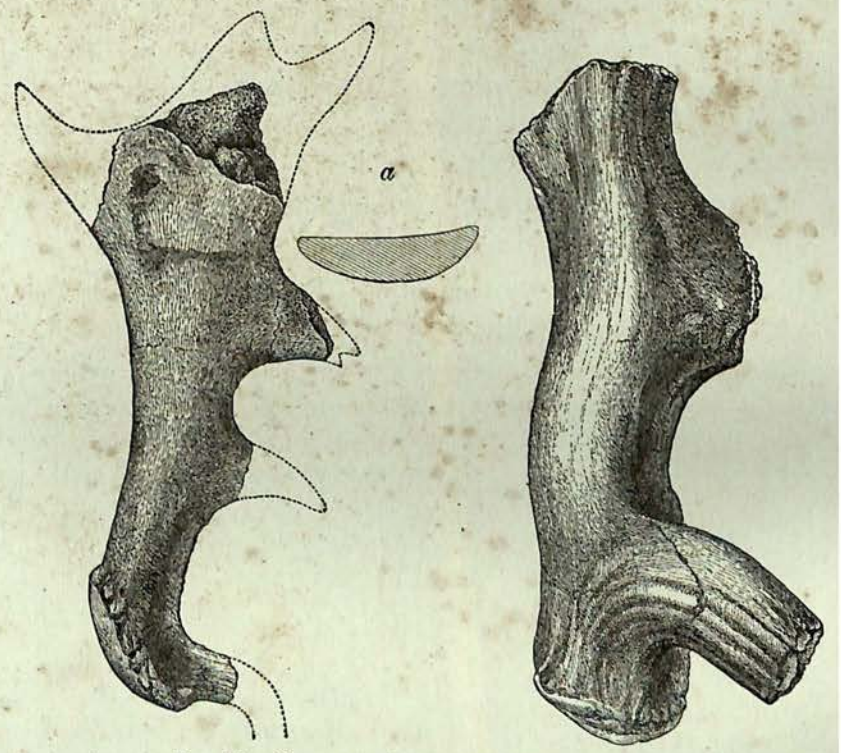


FIG. 25.—*Cervus verticornis*, Dawk., Forest Bed, ¼.

the former belong the great hairy mammoth (Fig. 22), the Irish elk, and two large deer (*Cervus verticornis*, Fig. 25, and *Cervus carnutorum*), a large beaver (*Trogontherium*), and the great cave bear, while the latter are represented by many species. In the woodlands and plains there were wild oxen (*uri*), stags, and roe-deer; in the rivers and streams, beavers and

water-rats; while among the smaller animals were the common shrew, the musk shrew (now inhabiting the banks of the Volga), and the common mole. Had he entered these forests in the autumn, he would have seen the wild boars eagerly seeking for acorns as they fell from the trees, and overhead squirrels feasting on the cones of the Scotch fir.

These living and extinct species formed the advanced guard of the Asiatic invasion of Europe at the close of the Pleiocene age, as described in the last chapter, which was probably due to the lowering of the temperature, by which animals hitherto living in Asia were driven to the south and west by the increasing cold in the northern regions. Their arrival marks the first phase of the Pleistocene age in Britain. They belong to the following species:—

Fauna of Forest-Bed.

Survivals from Pleiocene, Living Species.

Hippopotamus	*Hippopotamus amphibius.*

Survivals from Pleiocene, Extinct Species.

Bear of Auvergne	*Ursus arvernensis.*
Sabre-toothed lion	*Machairodus.*
Deer of Polignac	*Cervus polignacus.*
Sedgwick's deer	*Cervus dicranios = C. sedgwickii.*
Etruskan rhinoceros	*R. etruscus.*
Big-nosed rhinoceros	*R. megarhinus.*
Southern elephant	*Elephas meridionalis.*

New Comers, Living Species.

Musk shrew	*Sorex moschatus.*
Common shrew	*S. vulgaris.*
Water vole	*Arvicola amphibia.*
Red field vole	*A. glareolus.*
Mole	*Talpa europæa.*

Beaver	*Castor fiber.*
Wolf	*Canis lupus.*
Fox	*C. vulpes.*
Stag	*Cervus elaphus.*
Roe	*C. capreolus.*
Urus	*Bos primigenius.*
Wild boar	*Sus scrofa.*
Horse	*Equus caballus.*

New Comers, Extinct Species.

Extinct beaver	*Trogontherium cuvieri.*
Cave bear	*Ursus spelæus.*
Deer of the Carnutes	*Cervus carnutorum.*
Thick-antlered deer	*C. verticornis.*
Irish elk	*Megaceros hibernicus.*
Mammoth	*Elephas primigenius.*
Straight-tusked elephant	*E. antiquus.*

The proportion of eight Pleiocene survivals as compared with twenty incoming species in a total of twenty-eight, marks the enormous revolution which took place in the fauna of Europe at the close of the Pleiocene age, a revolution that is still further emphasised by the living species, amounting to no less than thirteen, as compared with the solitary living Pleiocene species.

Physical Relations of Forest-Bed.

The forest-bed,[1] in which the fauna and flora above mentioned are met with, extends from the base of the cliffs of Norfolk from between high and low water mark out to sea, passing inland under the cliff, in which it is covered up by strata that testify to the gradual lowering

[1] For further details relating to forest-bed and associated strata see Lyell, *Antiquity of Man*, 4th edit. p. 254. Prestwich, *Quart. Journ. Geol. Soc. Lond.*, 1871; p. 462 *et seq.* Searles Wood, *Palæont. Soc.* xxv. Crag Mollusca. Introduction.

of the temperature after the forest-bed ceased to flourish. In No. 3 of the accompanying section, Mr. Nathorst,[1] an eminent Swedish botanist, remarked in 1872 not only that the plants of the forest-bed became very much dwarfed in size, but that two new forms appear, now only found in severe climates; the polar willow (*Salix polaris*), now living within the Arctic circle, and a moss (*Hypnum turgescens*) common to the Arctic regions and

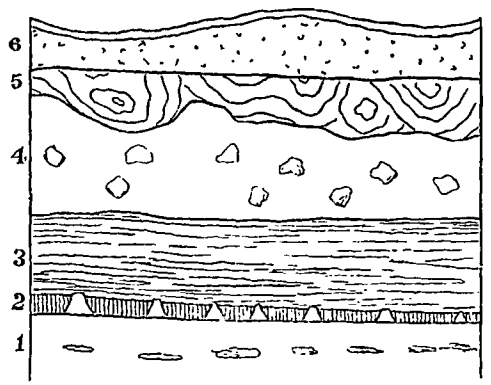


FIG. 26.—Physical Relations of Forest-bed.

1. Upper chalk, with flints.
2. Forest-bed, with stumps of trees and fossil mammalia.
3. Fluvio-marine sands and clays, with beds of lignite.
4. Boulder clay.
5. Contorted drift.
6. Sands and gravels.

the summits of lofty mountains. The fluvio-marine sands and clays imply also a change of level, by which the trees of the forest were brought within the reach of the waves of the sea. Above them is the boulder clay, No. 4, containing large blocks of granite and other igneous rocks, which have been transported by ice possibly from Scandinavia. This stratum corresponds with the older boulder clay of Messrs. Harmer and Searles Wood.

[1] Lyell, *Antiquity of Man*, 4th edit. p. 261.

The sands and red marls forming No. 5 owe their singular contortions and foldings probably to the grounding of large masses of ice, as well as to the subsequent melting of ice on which some parts of them had been originally deposited. The Forest-bed of this section is to be seen along the coast of Norfolk and Suffolk from Cromer as far as Pakefield, where it has been protected by the thick covering of sands and clays seen in the section, from the denuding forces, by which the traces of both forest and animals have been removed from other parts of Britain. Close on the destruction of the forest followed the depression of temperature marked in the lignites, No. 3, which arrived at its maximum in the period of the boulder drift, No. 4, when the area was invaded by icebergs. This was accompanied by a considerable geographical change. The North Sea rolled over both forests and lignites, and had become sufficiently deep, in Norfolk and Suffolk, to allow of icebergs depositing their burden to form the covering of boulder clay resting on the lignites and fluvio-marine strata.

Early Pleistocene Forests in France.

The forests of France, according to the recent investigations of the Count de Saporta,[1] present a regular series of changes in the Meiocene, Pleiocene, and Pleistocene ages, the tropical species gradually and successively retreating farther to the south. Under the present climatal conditions the species of fig-tree, known as *Ficus carica*, essentially a southern form, is not found farther north than 45° in central France, except under

[1] *Congrès Internationale d'Anthropologie et Archéologie Préhistorique* Stockholm. 1874, p. 80.

artificial conditions, ranging, however, farther northwards on the Atlantic coast-line under the mild and equable climate caused by the Gulf Stream. At Moret, near Fontainbleau, it flourished in the Pleistocene age about 4° farther north, and is proved by its numerous leaves and well-ripened fruits to have occupied an important place in the forest-clad valley of the Seine south of Paris. It was associated with ashes, sycamores, hoary poplars, grey and crack willows, spindle-trees, box, Judas-tree, and hazels. Ivy and clematis crept round the branches and hung in festoons overhead, while below were luxuriant clusters of the fronds of the hart's-tongue fern. The presence of the *Ficus carica* and the Judas-tree in this flora implies that the climate was equable, and that there were no winter frosts, such as those which check their growth so far north as Fontainbleau at the present time. In the late stage of the Pleistocene the winters were far more severe than at the present time in France and Britain, and from the evidence of the section of the Norfolk cliffs, there is reason to believe that there were severe winter frosts in the period immediately succeeding the Forest-bed. The forest of Moret, therefore, is referred to an early stage of the Pleistocene, and taken to be the equivalent of the pre-glacial forest of Norfolk. Here, however, it will be noted that the northern types, such as the Scotch fir, abound, while the southern are not represented; a difference which may be explained satisfactorily by the difference of latitude between Moret and Norfolk. As the evidence stands at present, the zone of northern forests in which the conifers are abundant is not met with at low elevations in France either in the Pleiocene or in the early Pleistocene periods.

The animals inhabiting the area of the Seine, while

this variety of fig-tree and the Judas-tree formed part of the forests, are represented by the remains found at St. Prest, near Chartres,[1] proving that the banks of the Eure were haunted by the horse, the southern elephant (*E. meridionalis*), the Etruskan rhinoceros (*R. etruscus*), a large extinct deer (*Cervus carnutorum*), and the large extinct beaver (*Trogontherium*). All these are found, as we have already seen, in the Forest-bed of Norfolk.

Evidence of Man in Early Pleistocene Strata doubtful.

In 1863 certain cut bones,[2] discovered in the deposit of St. Prest above mentioned, were considered by M. J. Desnoyers to be the work of man, and to imply his presence during the time of the deposit of the fluviatile strata in which they were buried. Some of these marks have been shown experimentally by Sir Charles Lyell to be capable of production by the gnawing of rodents, while others appear to Sir John Lubbock "to be probably of human origin." Their artificial character is accepted by most of the French archæologists, and supported by the discovery of flints worked by the hand of man, by the Abbé Bourgeois. Unfortunately, however, there is some doubt as to the precise stratum in which these were found. On the whole, it is more prudent to follow Sir John Lubbock in putting this evidence to a "suspense account," rather than to take it to show that man was living in the early Pleistocene age. We will therefore

[1] Lartet, *La Seine*, par M. Belgrand, ii. p. 206. Gervais, *Animaux Vertebrés Vivants et Fossiles*, 4to, p. 80.

[2] *Comptes Rendus*, 8th June 1863. Lyell, *Antiquity*, 4th edit. 233 Lubbock, *Prehistoric Times*, 2d edit. 410. Hamy, *Paléontologie Humaine* p. 89 *et seq.*

leave the question open, to be solved by future discoveries, with the remark that in this case there is no inherent improbability of its being answered in the affirmative, as in the alleged cases of man's presence in more ancient deposits, since numerous mammalia now living in Europe were then in possession of the land.

The Mid-Pleistocene Mammalia.

A group of animals, differing in many important particulars from the above, has been met with at Ilford and Grays Thurrock in Essex, at Erith and Crayford in Kent, and at Clacton on the Essex coast. They differ from the early Pleistocene group chiefly in the absence of most of the Pleiocene survivals, as well as by the incoming of species hitherto unknown, among which man is to be reckoned.

The extraordinary mixture of forms will be seen from the examination of the following table, in which the survivals have been separated from the newcomers, constituting fifteen out of a total of twenty-six species. The extraordinary deer of the Forest-bed are no longer to be seen, and the Etruskan rhinoceros has been replaced by the leptorhinë or small-nosed rhinoceros of Owen. The woolly rhinoceros, the companion of the mammoth in its wanderings from the steppes of northern Siberia as far south as the Alps and Pyrenees, appears for the first time. It must also be remarked that the valley of the lower Thames is the only place known where the woolly and leptorhine rhinoceros are found side by side with the big-nosed species. The southern elephant, which survived from the Pleiocene into the early Pleistocene stage, is no longer present, and had either become extinct

or had retreated southwards from Britain and France into Italy.

Mid Pleistocene Mammalia.

Survivals from Early Pleistocene—Living Species = 11.

		Ilford.	Grays Thurrock	Crayford, Erith.
Brown bear	*Ursus arctos*	×	×	×
Wolf	*Canis lupus*	×	×	×
Fox	*C. vulpes*	×	×	—
Stag	*Cervus elaphus*	×	×	×
Roe	*C. capreolus*	×	×	—
Urus	*Bos primigenius*	×	×	×
Hippopotamus	*Hippopotamus major*	×	×	—
Horse	*Equus caballus*	×	×	×
Wild boar	*Sus scrofa*	—	×	—
Beaver	*Castor fiber*	×	×	—
Water rat	*Arvicola amphibia*	×	×	×

Survivals from Early Pleistocene—Extinct Species = 4.

Irish elk	*Megaceros hibernicus*	×	×	×
Big-nosed Rhinoceros	*Rhinoceros megarhinus*	×	×	×
Mammoth	*Elephas primigenius*	×	×	×
Straight-tusked elephant	*E. antiquus*	×	×	×

Newcomers—Living Species = 9.

Man		—	—	×
Lion	*Felis leo*	×	×	×
Wild cat	*Felis catus*	—	×	—
Spotted hyæna	*Hyæna crocuta*	—	×	×
Otter	*Lutra vulgaris*	—	×	—
Grisly bear	*Ursus ferox*	×	×	×
Bison	*Bison priscus*	×	×	×
Musk sheep	*Ovibos moschatus*	—	—	×
Marmot	*Spermophilus*	—	—	×

Newcomers—Extinct Species = 2.

Woolly rhinoceros	*R. tichorhinus*	×	—	×
Small-nosed rhinoceros	*R. leptorhinus*, Ow. (= *R. hemitœchus*, Falc.)	×	×	×

Evidence of the Presence of Man.

Man is proved to have belonged to this fauna by the discovery, in 1872, in my presence, of a flint flake in the lower brick-earths at Crayford, by the Rev. Osmond Fisher.[1] It was *in situ* in No. 2 of Fig. 31, in the same stratum of gravel in which I discovered the skull of the musk-bull in 1866, now preserved in the Museum of the Geological Survey. Subsequently, in 1876, a second implement[2] was found in the same series of beds at Erith, also *in situ*, at a point about two inches above the shell-band in the pits. It is a roughly-chipped flake, considerably worn by use (Fig. 27). It may be remarked that this form of cutting implement, so abundant, as we shall see, in the late Pleistocene age, was used also in the Neolithic and Bronze ages, ultimately being employed within the Historic period by the Egyptians and by the Romanised Britons of Sussex and Kent, in whose tombs it was placed from

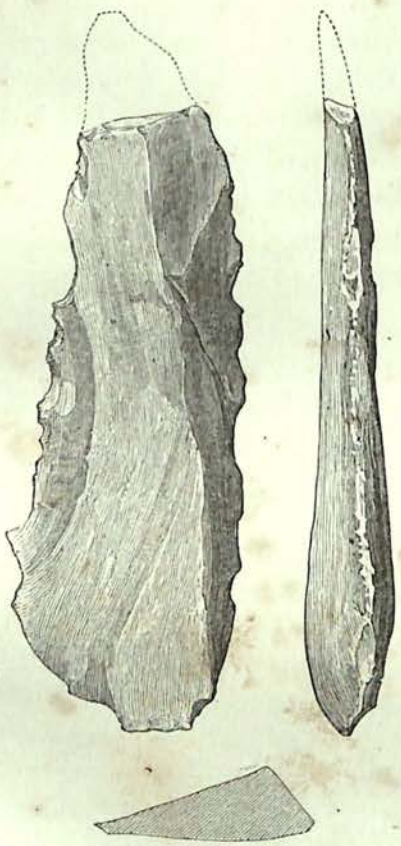


FIG. 27.—Flint flake, Lower Brick-earths, Erith, ½.

[1] *Geol. Mag.*, 1872, p. 268.

[2] Messrs. Cheadle and Woodward, *Proceed. West London Scientific Association*, Sept. 1876, "Notes on Pleistocene Deposits at Crayford and Erith."

some superstitious motive. This form, the simplest for cutting purposes, is also the earliest trace of man in this country, as it is the latest survival from the Palæolithic age. From its distribution almost over the whole earth, wherever the ancient remains of man have been explored —in Europe, Africa, India, Japan, and the Americas—it might have been inferred to be one of the oldest implements invented by mankind. Its discovery in two separate spots establishes the fact that man was living in the valley of the lower Thames before the arctic mammalia had taken full possession of the valley of the Thames, and before the big-nosed rhinoceros had become extinct. In no other locality have the traces of man been discovered, up to this time, in association with the remains of this animal.

The primeval hunter, who followed the chase in the lower valley of the Thames, armed with his rude implements of flint, must have found abundance of food and have had great difficulty in guarding himself against the wild animals. Innumerable horses, large herds of stags, uri, and bison, were to be seen in the open country; while the Irish elk and the roe were comparatively rare. Three kinds of rhinoceros and two kinds of elephant lived in the forests. The hippopotamus haunted the banks of the Thames, as well as the beaver, the water-rat, and the otter. There were wolves, also, and foxes, brown bears and grisly bears, wild cats and lions of enormous size. Wild boars lived in the thickets: and as the night came on, the hyænas assembled in packs to hunt down the young, the wounded, and the infirm.

The Arctic Mammalia present.

The most important point to be remarked after the presence of man is that of two animals now only found in cold climates — the musk sheep (see Fig. 31) and the pouched marmot. The latter has been recently obtained by Mr. Flaxman Spurrell, with the bones in such a position as to prove that the animals had been surprised by floods while hibernating, and drowned. The first of these is now only to be found within the Arctic circle in America, while the second lives in the mountainous regions of Europe and the colder climates of Asia. They prove that the arctic mammalia were then in Britain.

Physical Relations of Mid Pleistocene Strata.

The physical relations of these strata, containing the traces of man and remains of the mammalia, are very

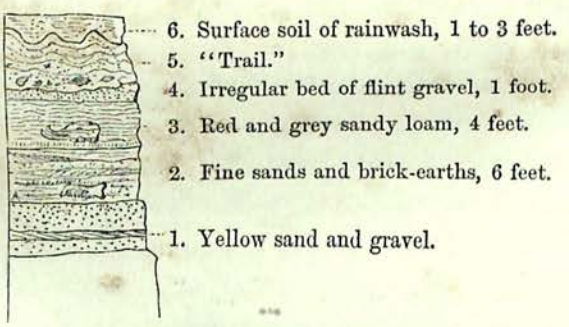

6. Surface soil of rainwash, 1 to 3 feet.
5. "Trail."
4. Irregular bed of flint gravel, 1 foot.
3. Red and grey sandy loam, 4 feet.
2. Fine sands and brick-earths, 6 feet.
1. Yellow sand and gravel.

FIG. 28.—Lower Brick-earths, Uphall, Ilford.

interesting from the possibility that they may belong to a time before the glacial climate had set in. At Ilford, for example, Fig. 28, the strata may be divided into three groups, deposited under different conditions.

The lower fluviatile strata, 1 to 4, are full of river shells, and bones and teeth of animals, among which those of the mammoth were incredibly abundant, its remains in Sir Antonio Brady's collection alone being estimated by Mr. Woodward to belong to more than one hundred individuals. Above these strata is a layer of clay, brick-earth, and gravel, No. 5, irregular and twisted, and folded in a very remarkable way, somewhat after the manner of the contorted drift on the Norfolk coast above mentioned. It contains pebbles of quartz, Lydian stone, sandstone, angular and waterworn flints, and fragments of grey wethers, one of which weighed 26 pounds. Some of the pebbles are imbedded with their long axes vertical, and therefore could not have been deposited by the action of water. This singular stratum, termed "loess" by Prestwich and "trail" by Fisher, bears unmistakable signs of having been accumulated by the action of ice, which has caught up the various materials of which it is formed, and deposited them on melting with the utmost irregularity. It proves that the climate at the time was more severe than that which prevailed while the mammaliferous strata below were being formed.

Above it the surface is composed of the ordinary rainwash of the district, fine red loam, No. 6, which has been accumulated under the climatal conditions of the present time. It contrasts with the bed on which it rests in its homogeneous nature.

This section is repeated with but little variation at Grays Thurrock opposite Gravesend, at a distance of about twelve miles. From the lower fluviatile strata of this locality, the most important remains which have been discovered belong to the big-nosed rhinoceros, which frequented the spot in considerable herds, both

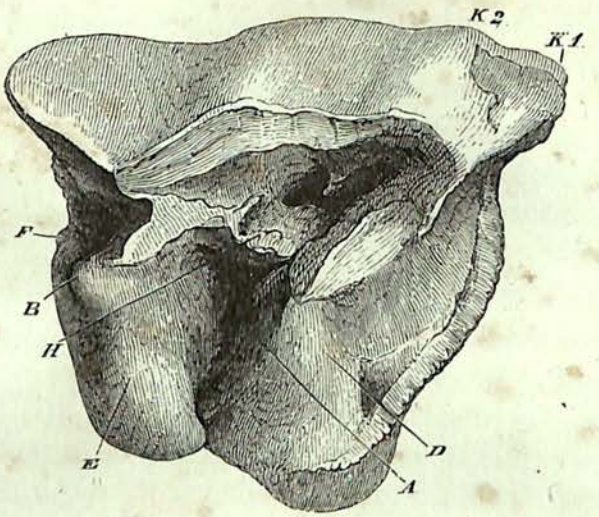


FIG. 29.—Upper true molar of *Rhinoceros megarhinus*, ½.

young and old being represented, as may be seen from Figs. 29, 30. It is also repeated on the other side of the

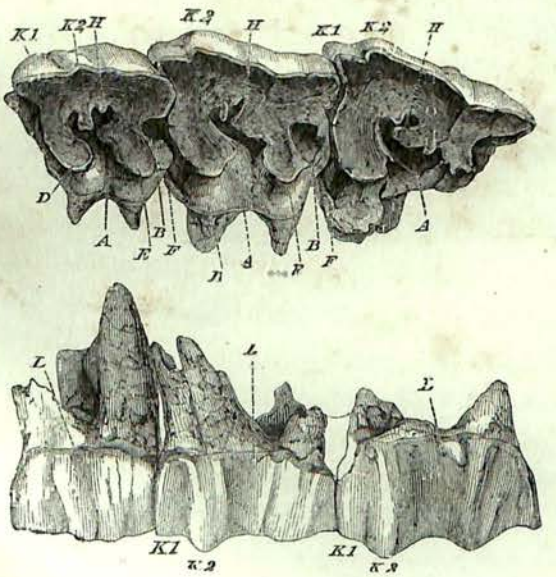


FIG. 30.—Upper milk molars of *Rhinoceros megarhinus*, ½.

Thames at Crayford and Erith, as may be seen from the examination of Fig. 31. In this locality, in bed No. 5 at Erith, there is unmistakable proof of the action of ice in an angular lump of clay torn from the Eocene

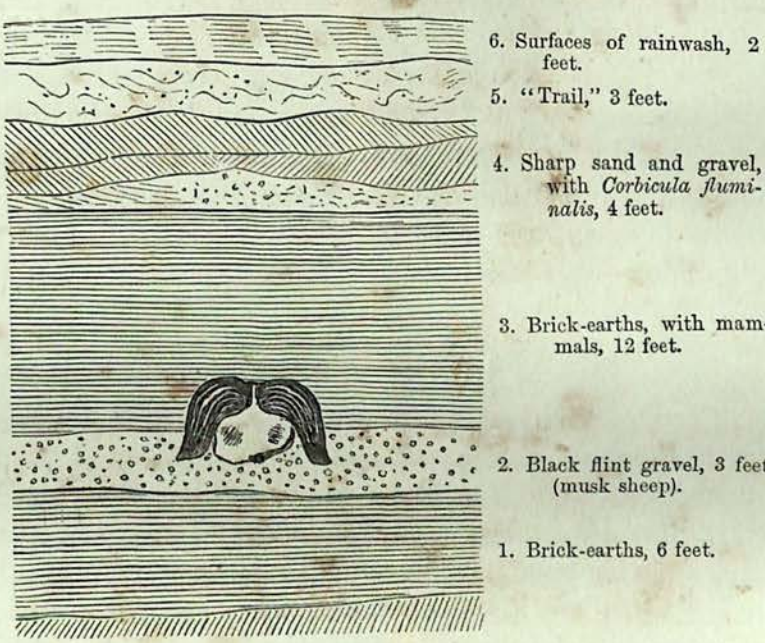

6. Surfaces of rainwash, 2 feet.
5. "Trail," 3 feet.
4. Sharp sand and gravel, with *Corbicula fluminalis*, 4 feet.
3. Brick-earths, with mammals, 12 feet.
2. Black flint gravel, 3 feet (musk sheep).
1. Brick-earths, 6 feet.

FIG. 31.—Lower Brick-earths of Stoneham's Pit, Crayford.

beds, which had evidently been deposited while it was frozen, since it had suffered no abrasion in the course of its transport, more than 150 yards from the Eocene strata then forming the banks of the ancient Thames at this point.

It seems to me very probable that "the trail," which undoubtedly has been accumulated under severe climatal conditions, may be the equivalent of the boulder clays found on the northern side of the lower Thames in Essex and Hertfordshire. In that case the remains of man and

of the other animals, buried in the fluviatile strata below, may be considered preglacial. If, however, it be referred to the action of the snows and the frosts of the late Pleistocene age, the strata in question, from their position below, must be older than that age. The mammalia then inhabiting the district are intermediate in character between those of the forest-bed and those of the late Pleistocene strata, and lived in that area before the cold was sufficiently severe to drive away the big-nosed rhinoceros, and cause the feeding grounds of the stags, fallow deer, and uri, to be enjoyed by the countless herds of reindeer and bisons.

Level not an Absolute Test of Age.

For these reasons, these river-deposits in the valley of the Thames and at Clacton are taken to be older than those of the late Pleistocene so widely distributed through middle and southern England, and they may date back to the preglacial age, as Dr. Falconer[1] inferred from the study of the mammalia. They are, on the other hand, assigned by Professor Prestwich[2] to a late period in the Pleistocene age because they are at a low level. The use of relative levels as a test of age is, however, valid only under two conditions.[3] The valley must be assumed to have been cut down by the stream flowing along the bottom, and the fluviatile deposits to have been formed at different levels as the river bottom became lowered. It must also be assumed that the land

[1] Falconer, *Quart. Jour. Geol. Soc. Lond.*, xiv. p. 83.

[2] Prestwich, *Geol. Mag.*, i. 245.

[3] For full statement of this argument see *Quart. Jour. Geol. Soc. Lond.*, xxiii. p. 91.

has remained *stationary* at one level above the sea. The valley of the lower Thames was probably excavated in the Pleiocene age, and is proved by the large sheets of boulder clay and the marine shingle in Essex and Hertfordshire to have been submerged after the end of the early Pleistocene age. It was re-elevated while the late Pleistocene deposits were being formed in the area between Oxford and the mouth of the Thames. Here, then, as in the case of the submarine forest-bed of Norfolk, we cannot consider that the age is settled by the level. The lower brick-earths seem to me to be isolated patches of a series of fluviatile deposits, of which the higher and more exposed portions have been destroyed by the rain, rivers, snow, ice, and sea, and other agents ever at work in re-modelling the surface of the earth.

Mid Pleistocene Caverns.

It is a very singular and striking fact, that although caverns must have existed in all ages of the earth's history, and have been used for shelter by the animals, there are none older than the mid Pleistocene times. There is every reason to believe that they were haunted by the Eocene, Meiocene, and Pleiocene beasts of prey, and that the anoplotheres and palæotheres, the deinotheres and mastodons, the deer and the antelopes, were either dragged in by the carnivores, or swept in by the flow of water, after the same manner as the remains of the successive groups of animals have been introduced which have inhabited Europe from the Pleistocene age down to the present day. Why then do we not meet with ossiferous caverns of those times? The simple answer is to be found in the realisation of the enormous

destruction of the land which has taken place in the long lapse of ages, to which attention has already been directed in treating of the Meiocene period. In my opinion there have been ossiferous caverns in all geological periods, but they and all shelters then accessible to animals, together with the rocks in which they were hollowed, have been carried away so completely that no traces of any caverns of those times have been discovered in any part of the world. The rain, the alternation of heat and cold, the carbonic acid in the atmosphere, the acids evolved from decaying vegetation, and the breakers on the sea-shore, have wrought this wholesale destruction so thoroughly that there are only two caverns that can be said to be even as old as the mid Pleistocene. In one of these, at Oreston near Plymouth, Mr. Whidbey[1] discovered the remains of the big-nosed rhinoceros in the year 1816. The other is at Baume, in the Jura, in which the remains described by Professors Lartet[2] and Gervais were found, belonging to the machairodus, a non-tichorine rhinoceros, to the ox, wild boar, elephant, spotted hyæna, and cave bear. In both these the mammalia are identical with those of the mid Pleistocene, with the exception of the machairodus, which must, however, have been living at that time, since it occurs in mid and late Pleistocene strata.

[1] See Buckland, *Reliquiæ Diluvianæ*, 4to, p. 67. Busk, *Quart. Geol. Soc. Journ.*, Lond., xxvi. p. 457.

[2] Gervais, *Animaux Vertebrés*, p. 78, Pl. 18. Lartet, *Congr. Int. Préhist. Archéol.*, 8vo, Paris, p. 269.

The Lignites of Dürnten present no Traces of Man.

The lignites of[1] Dürnten and Utznach, before mentioned, reveal to us the forests covering the Cantons of Zurich and St. Gall during the mid Pleistocene age, and which still continue to flourish in the same region. They consisted of spruce firs (*Pinus abies*), Scotch firs, and mountain pines (*P. sylvestris and P. montana*), larches, yews, birches, and sycamores, with an undergrowth of hazel. In them were to be met the straight-tusked elephant (*E. antiquus*), the big-nosed rhinoceros (*R. Merkii*, Jäger), the urus, and the stag, all of which lived in the mid Pleistocene period in the area of the lower Thames. These deposits of lignite, formed on the swampy sides of a lake, rest on a series of clays with stones that have been deposited by a retreating glacier, and they are also covered with a similar deposit of a glacier which occupied that area after the disappearance of the forest, and they are therefore interglacial.

To the animals found in the lignite beds, Professors Rütimeyer and Schwendauer have added man, on data which seem to me unsatisfactory. Several sticks about the size and shape of a cigar, with their outsides enveloped by fibres running at right angles to their long axes, are considered to be the remains of a kind of fossil basket-work. In the summer of 1877, on examining these specimens at Basel, thanks to the kindness of Professor Rütimeyer, I was struck by their resemblance to knots out of rotten pine trunks, in which a similar form is frequently to be observed. As the woody fibre of the

[1] Heer, *Primeval World of Switzerland*, ii., Appendix 1, c. 12. Rütimeyer, *Archiv für Anthropologie*, Aug. 1875, p. 133; *Ueber die Herkunft unserer Thierwelt*, 4to, 1867, p. 52 *et seq.*

trunk decays the hard resinous knots stand out in relief, and taper to a point as they approach the central pith of the tree, in the same way as those at Dürnten. They are, moreover, covered superficially by fibres of the trunk crossing those of the knots at right angles, or nearly so, precisely in the same way. The fossil specimens have been proved, by microscopical examination, to be composed of the wood of the spruce. Under these circumstances I have but little doubt of their being knots out of a decayed fir-tree without marks of the handiwork of man, and I cannot look upon them as evidence of the existence of man in Switzerland in interglacial times.

The Late Pleistocene Mammalia.

We pass now to the examination of the late Pleistocene deposits in Great Britain, in which artificially chipped implements, found in considerable numbers over a wide area, testify to the presence of man in this country for a very long period of time, reserving for the next chapter the evidence on the point offered by the bone caverns.

In the late Pleistocene river beds, and in the caves, the fauna is the same, and both are referable to the same geological horizon, marked by the arctic mammals being in possession of the land, as may be seen in the following table:—[1]

[1] This is an abstract of those published by Dawkins and Sanford, *British Pleistocene Mammalia*, Palæont. Soc., 1866, *et seq.*; Dawkins, *Quart. Journ. Geol. Soc. Lond.* vols. xviii. *et seq.*

MAMMALIA FOUND IN LATE PLEISTOCENE RIVER STRATA AND CAVERNS IN BRITAIN.

Survivals from Early and Mid Pleistocene—Living Species = 22.

	River Strata.	Ossiferous Caverns.
Man	×	×
Shrew		×
Grisly bear	×	×
Otter	×	×
Fox	×	×
Wolf	×	×
Spotted hyæna	×	×
Lion	×	×
Wild cat	×	×
Horse	×	×
Brown's fallow-deer	×	
Roe	×	×
Stag	×	×
Urus	×	
Bison	×	×
Hippopotamus	×	×
Wild boar	×	×
Water rat	×	×
Red field vole	×	×
Hare	×	×
Beaver	×	×
Mouse	×	×

Survivals from Early and Mid Pleistocene Extinct Species = 6.

Cave bear		×
Small-nosed rhinoceros	×	×
Woolly rhinoceros	×	×
Irish elk	×	×
Mammoth	×	×
Straight-tusked elephant	×	×

New Forms—Living Species = 17.

Lynx	×
Leopard	×
Caffer cat	×

	River Strata	Ossiferous Caverns.
Marten		×
Stoat		×
Weasel		×
Badger		×
Short-tailed field vole		×
Continental field vole		×
Russian vole	×	×
Pouched marmot	×	×
Arctic lemming	×	×
Norwegian lemming		×
Reindeer	×	×
Arctic fox		×
Glutton		×

To this list of the new species must be added the Alpine hare of Scotland and Ireland, which most probably arrived in Britain along with the other arctic mammalia, and possibly also the rabbit, although the evidence offered by the frequent discovery of its remains in the caverns is rendered doubtful by its burrowing habits.

The arctic mammalia in this latest phase of the Pleistocene period were in full possession of the land, and the only two survivors from the Pleiocene age are the extinct *Machairodus latidens* and the hippopotamus.

The Late Pleistocene Geography.

The remains of the late Pleistocene animals lie scattered over a large area in Britain, and it is necessary to conclude from their presence that our country formed part of the mainland[1] of Europe at that time. This hypothesis is proved by their occurrence in various places now covered by the sea, as, for example, the

[1] *Cave-hunting*, c. ix.

mammoths found in Holyhead Harbour, off Torquay, off the coast of Sussex, and in the North Sea. On the Dogger Bank the accumulation of bones, teeth, and antlers is so great that Mr. J. J. Owles, of Yarmouth, collected more than 300 specimens from the fishermen, who casually bring them up in their nets and dredges.[1] They belong to the bear, wolf, spotted hyæna, Irish elk, reindeer, stag, urus, bison, horse, woolly rhinoceros, mammoth, and beaver, and are to be viewed as the remains of animals living in the district at that time, and deposited by a river current, great with small, as in the case of similar accumulations on the land. Had they been deposited by the sea they would have been sifted by the action of the waves, and the smaller would have been heaped together in one place, and the larger in another. The dead carcases had evidently been collected in the eddies of a river that helped to form the Dogger Bank, which rises to within eight fathoms of the sea-level. Other testimony as to the former elevation of the British area is afforded by the discovery of a fresh-water mussel (*Unio pictorum*) at a depth of 50 to 100 fathoms, recorded by Mr. Godwin Austen, in the English Channel, not very far from the point in the map where the river (see Fig. 32) entered the Atlantic. From this point the 100-fathom line passes southwards to the coast of Spain, and northwards far away to the west of Ireland, turning eastward, north of the Orkneys, in the direction of Norway, and dividing the gently undulating surface of the plateau now submerged on the east from the depths of the Atlantic on the west. This we may

[1] Since my examination of them in 1868, they have been transferred to the British Museum, and have been catalogued by Mr. Davies. *Geol. Mag., Decade II.* vol. v. No. 3, 1878.

accept with Godwin Austen, De la Beche, and Lyell, as the Atlantic coast-line at this time. On the north, a

FIG. 32.—Geography of Britain in Late Pleistocene Age.

narrow tract of sea, from 200 to 300 fathoms deep, separated the British land from the coast of Norway.

From these lines of reasoning it may be concluded that Britain stood at least 600 feet above its present level, and that the rivers of our eastern coast, the Thames, Medway, Humber, Tyne, and others, joined the Rhine, the Weser, and the Elbe, to form a river flowing through the valley of the German Ocean, as represented in the map. In like manner, the rivers of the south of England, and of the north of France, formed a great river flowing past the Channel Islands due west into the Atlantic, and the Severn united with the rivers of the south of Ireland; while those to the east of Ireland joined the Dee, Mersey, Ribble, and Lune, as well as those of western Scotland, ultimately reaching the Atlantic to the west of the Hebrides. The watershed between the valleys of the British Channel and he North Sea is represented by a ridge passing due south from Folkestone to Dieppe, and that between the drainage area of the Severn and its tributaries on the one hand, and of the Irish Channel on the other, by a ridge from Holyhead westward to Dublin.

This tract of low undulating land which surrounded Britain and Ireland on every side consisted not merely of rich hill, valley, and plain, but also of marsh land studded with lakes, like the meres of Norfolk, now indicated by the deeper soundings. These lakes were very numerous to the south of the Isle of Wight, and off the coast of Norfolk and Suffolk.[1]

[1] *Admiralty Charts*, Stieler's *Hand Atlas*, Ramsay's *Orographical Map of England and Wales.*

The Range of the Late Pleistocene Mammals over Britain and Ireland.

If the dotted surface of the Map, Fig. 32, be examined, representing the areas in which the remains of the late Pleistocene animals have been found, it will be noted that they are distributed very irregularly in the river deposits. The greater part of Wales, as well as the hilly parts of northern Yorkshire, including Cumberland and Westmoreland, have not as yet furnished any evidence of the former existence of these animals. In Scotland the mammoth and the reindeer have been met with in the lowlands;[1] and the former has been discovered, according to Mr. Paton,[2] in Caithness.

In Ireland the mammoth has been found in the counties of Cavan, Galway, Antrim, and Waterford, and in the Shandon cave, near Dungarvan, in the first of these counties, along with the grisly bear, wolf, fox, horse, stag, and alpine hare.[3] This irregularity in the distribution of the animal remains is intimately connected with the geographical and climatal changes which were going on in the obscure and complicated portion of the late Pleistocene age known as the glacial period.

On taking every point of view into consideration, Mr. Jamieson's opinion,[4] that the mammoth was in Scotland before the glacial period, seems to me to be true; and it is highly probable that all the Irish mammalia mentioned above are preglacial. In that case these animals must be looked upon as the representatives of a fauna,

[1] See *Quart. Journ. Geol. Soc. Lond.* xxxiv. p. 139.
[2] Letter to Author of 11th Nov. 1878.
[3] Leith Adams, *Trans. R. Irish Acad.* xxvi. p. 187.
[4] Jamieson, *Quart. Journ. Geol. Soc. Lond.* xix. p. 258.

the remains of which happen to have been preserved, in spite of the erosion of the surface by the glaciers and the dash of the waves on the sea-shore, during the repeated depressions and elevations of the land described in the last chapter.

The presence of the late Pleistocene mammalia in the river deposits later than the boulder clays as far as the North Riding of Yorkshire, proves that they were in Britain after the land had been elevated above the sea, in which the icebergs had deposited their burdens of upper boulder clay in the midland and northern counties. They were, however, living in the south of England and in France, while the boulder clays and marine sands were being accumulated in the area north of London and Bristol. As this rose above the sea, they gradually passed farther north, and it is very probable that they were prevented from invading Ireland and Scotland by a barrier of sea, and that the higher parts of the country were rendered inaccessible by the glaciers, as yet unmelted.

Thus we may picture to ourselves southern and eastern Britain as inhabited by an abundant mammalian fauna during the last phase of the Pleistocene age; while ice and sea acted as barriers to the free migration which afterwards took place over the whole country in the Prehistoric age. We must further realise that all the climatal and geographical changes, known as glacial, happened while the late Pleistocene mammalia were living in the regions not covered by glaciers or overwhelmed by sea, and that they wandered to and fro as the barriers to their migration were altered. The glacial period did not define one fauna from another, and the only mark it made on the mammalian life was to push

the arctic division farther down to the south as the cold increased, and, as it waned, to allow of their coming northwards again.

The Late Pleistocene River-deposits.

Superficial deposits containing the remains of the late Pleistocene animals swept down by the floods are present in most of the river-valleys in the eastern, central, and southern portions of Great Britain. They consist of sand, gravel, and loam, or brick earth, and are found sometimes below the level of the present streams, as, for example, in the lower Thames in the neighbourhood of London, or, as is usually the case, on the sides at various elevations above the water-level. They are proved by the presence of shells of fresh-water mussels, fresh-water snails, and others, to have been accumulated at the bottom of rivers which have cut their way down to, or below, their present level since they were formed. From this we may conclude that the present system of hill and valley was then sketched out, but that in some places the valleys have been considerably deepened by the erosive action of the stream; while in others their lower parts have been filled up in the late Pleistocene age.

Sometimes the river flowed over what is now the top of a hill or the top of a cliff, as in the case of Bemerton (Fig. 36) and the fluviatile strata on the cliffs near Southampton Water, described by Mr. Codrington, and those of Reculver, described by Professor Prestwich.[1]

It must not, however, be supposed that the rivers in any case occupied the whole of the valley at one time. The swinging of the current from one side to the other,

[1] *Quart. Journ. Geol. Lond.* xvii. 364; xxvi. 528 *et seq.*

and the accumulation of shingle banks and of silt on the inner side of the curves, will satisfactorily account for the manner in which the deposits are distributed. The river would visit each part of the valley in succession, leaving behind its *débris* at the levels which it successively occupied.

The Reindeer-ford at Windsor.

The discovery of numerous fossil bones, teeth, and antlers in a bed of gravel by Captain Luard, R.E., in digging the foundations for the new cavalry barracks at Windsor, in 1867, affords us the means of forming a striking picture of the valley of the Thames in the late Pleistocene age. On visiting the spot with him, I found that more than one half of the remains belonged to the reindeer, the rest to bisons, horses, wolves, and bears. They had evidently been swept down by the current from some point higher up the stream. In illustration of this accumulation a parallel case may be quoted from the observations of Admiral Von Wrangel, in Siberia. "The migrating body of reindeer," he writes, "consists of many thousands, and though they are divided into herds of two or three hundred each, yet the herds keep so near together, as to form only one immense mass, which is sometimes from fifty to a hundred wersts, or thirty to sixty miles, in breadth. They always follow the same route, and in crossing the river Aniuj, near Plobischtsche, they choose a place where a dry valley leads down to a stream on one side, and a flat sandy shore facilitates their landing on another. As each separate herd approaches the river, the deer draw more closely together, and the largest and strongest takes the

lead. He advances, closely followed by a few of the others, with head erect, and apparently intent on examining the locality. When he has satisfied himself he enters the river, the rest of the herd crowd after him, and in a few minutes the surface is covered with them."[1] Wolves, bears, and foxes hang upon the flanks and rear of these great migratory bodies, and prey upon the stragglers; and invariably many casualties occur at the fords, where the weak or wounded animal is swept away by the current. From these facts we may infer that a Palæolithic hunter, standing on one of the hills commanding a view of the district above Windsor in the winter time, would have seen vast herds of reindeer crossing the stream, and in the summer herds of horses and bisons availing themselves of the same fords, with wolves and bears in their train. We shall see, in the next chapter, that reindeer and bisons occupied the same districts of Derbyshire in different seasons of the year; and we may therefore conclude that the same thing happened in the valley of the Thames.

In other fluviatile deposits in the Thames valley the reindeer has been found in considerable abundance—at Kew, for example, in association with the bison, and in London with the lion, Irish elk, bison, urus, horse, woolly rhinoceros, mammoth, straight-tusked elephant, and hippopotamus.

Palæolithic Implements in the Valley of the Thames.

The presence of man at this time in the valley of the Thames is proved by a series of discoveries dating from

[1] *Siberia and Polar Sea*, trans. by Major Sabine, 1840, 8vo, p. 190. These obviously exaggerated figures must be taken to represent the vast numbers of the animals.

FIG. 33.—Flint River-drift Implement, Gray's Inn Lane, ½.

the close of the seventeenth century down to the present. A roughly-chipped pointed implement of flint[1] was dug up about the year 1690, in association with the remains of an elephant, in the gravel at Gray's Inn Lane,[2] and after being preserved for more than 150 years in the Sloane Collection and in the British Museum, was ultimately recognised by Mr. Franks as identical with those which were discovered in the river gravels of Amiens and Abbeville during the second quarter of the present century. Its shape is very well shown in the accompanying figure, borrowed from the work of Mr. John Evans, D.C.L.

Similar implements, together with triangular flint flakes of the type Fig. 27, and rounded scrapers for the preparation of skins, in form like that of the preceding figure, but with their ends rounded, are described by General Lane Fox[3] from the gravel of Acton Church, on the north side of the Thames, in association with the mammoth, and under conditions shown in the following section (Fig. 34).

The implements occur very generally here as elsewhere at the bottom of the gravels on the London Clay, and vary in size according to the size of the surrounding flints, from which it may be inferred that either they were made of materials on the spot where they are found, or, as is more probable, that they have been deposited by water by which they have been sorted in the same manner as the gravels in which they are imbedded. A

[1] These implements are termed Palæolithic, in contradistinction to the polished ones of the newer stone age or the Neolithic.

[2] For details relating to these discoveries, see Evans, *Ancient Stone Implements*, p. 521.

[3] *Quart. Geol. Journ. Lond.* xxviii. p. 449.

trunk of a tree, and the rhizome of a fern found along with them, have been identified by Mr. Carruthers as a

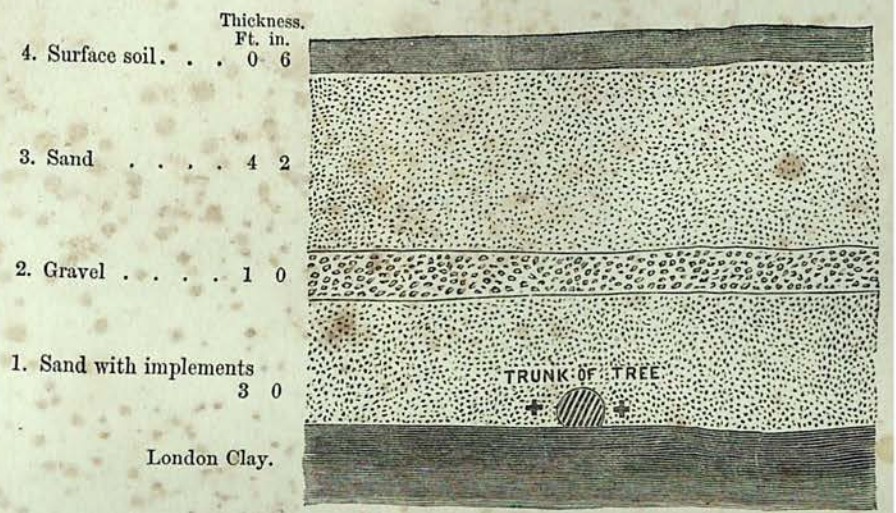


FIG. 34.—High Terrace Gravel, Lorne Terrace, Myrtle Road, Acton.

pine (probably the Scotch fir), and one of our indigenous ferns, either the male fern or the osmund royal.

In the "Mid Terrace Gravel" at Brown's orchard, at a distance of about one and a half miles from the above locality, many fossil animals have been determined by Professor Busk, consisting of the small-nosed rhinoceros, horse, hippopotamus, bison, Brown's fallow-deer, stag, reindeer, grisly bear, and mammoth, on a layer of gravel resting on the London Clay (Fig. 35). No Palæolithic implements have been discovered in the gravels at this level; but they have been obtained out of the bed of the Thames at Battersea and Hammersmith, so that man is proved to have been dwelling in the neighbourhood of London, while the gravels were being accumulated high above the Thames, as well as while they were being formed at and below its present level. It may therefore

be inferred that he was a contemporary of these animals which frequented the valley of the Thames in the inter-

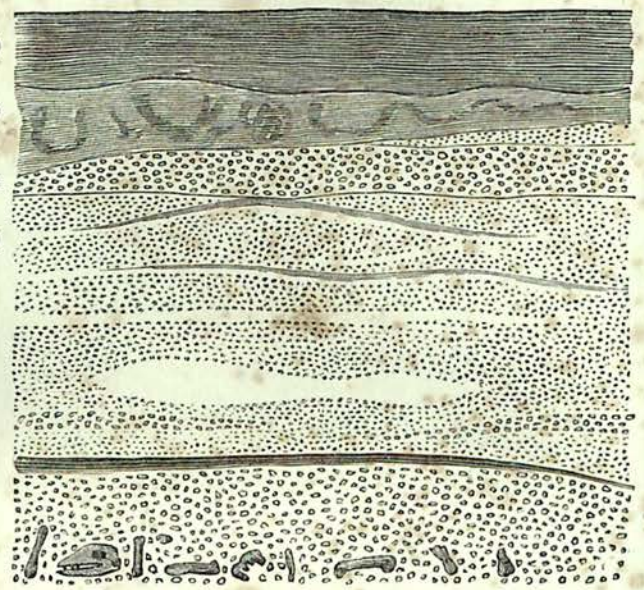

Thickness.
Ft. in. Ft. in.
6. Surface soil 1 6 to 2 0
5. Mixed earth 0 6 to 2 0
4. Gravel . . 0 6 to 1 3
3. Sand . . 0 8 to 0 0
2. Black seam.
1. Gravel with bones.

FIG. 35.—Mid-Terrace Gravel, Brown's Orchard, Acton Green.

mediate period.[1] This view is strengthened by the parallel case offered by the deposits in the valley of the Wily, near Salisbury.

[1] Flint implements have been obtained from many other beds of gravel in and about London, at Shacklewell, Lower Clapton, and in various other localities in Kent, Surrey, and Hertfordshire. In some cases, as in those of Canterbury, to which Mr. W. G. Smith has directed my attention, they have been rolled in the bed of the stream before they were deposited, and afterwards the bed of gravel in which they lay has been worked over again by the stream and re-deposited, each change being marked by new fractures and abrasions. A similar series of changes has taken place in the lowest deposits in Kent's Hole, described in the next chapter.

River-drift Man in the Neighbourhood of Salisbury.

The fluviatile gravels near Salisbury[1] have furnished implements of the same kind as those of the valley of the Thames in several places, among which those at Bemerton and Fisherton are the most important. At

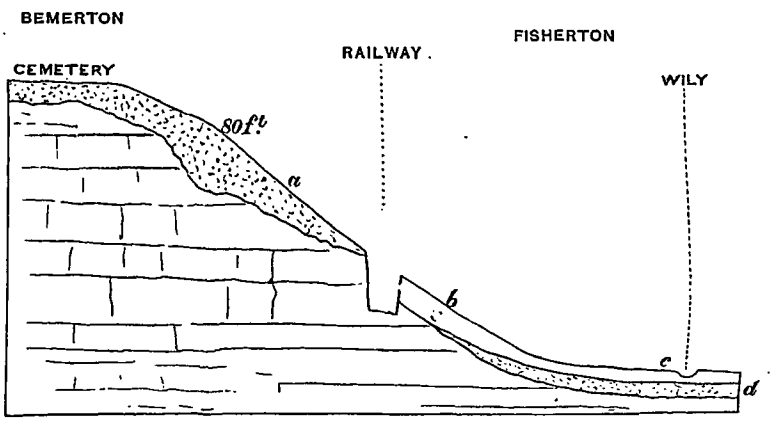


FIG. 36.—Late Pleistocene Strata at Fisherton.

a = Gravel with implements.
b = Brick-earths with implements and mammals.
c = Alluvium.
d = Gravel.

Bemerton, about twenty implements have been obtained in a bed of flint gravel, *a*, ranging as high as 100 feet above the River Wily (Fig. 36), and some of these have lost their sharpness of outline from having been rolled in the river, when it flowed at a higher level than the stratum in which they are imbedded, now forming the summit of the hill. It contained no fossil remains. In the stratum, however, on the slope of the valley at Fisherton, *b*, dipping

[1] See Evans, *Ancient Stone Implements*, p. 549, and *Quart. Geol. Journ Lond.* xx. 188. Stevens, *Flint Chips*, p. 47. The mammalia have been determined by Dr. Blackmore and Mr. Alston.

down beneath the alluvium of the river, many species of mammalia have been discovered along with Palæolithic implements, proving that the hunter of those times would not be likely to suffer from want of game in Wiltshire. In the spring, summer, and autumn, there were stags, bisons, uri, horses, pouched marmots, woolly rhinoceroses, and mammoths, and in the depth of winter, lemmings, reindeer, and musk sheep. Wild boars were in the woodlands, and hares in the glades. The hunter had, however, formidable beasts of prey, the lion and the spotted hyæna, as his competitors in the chase. In the spring time Fisherton was a nesting-place for the wild goose, and the heavy floods, rushing down the valley of the Wily at the break up of winter, occasionally surprised the marmots before they awoke from their winter's sleep, and sometimes deposited their bodies in the sediment at the bottom of the river.

The implements in both these localities are oval, pointed, and pear-shaped (see Figs. 33, 37), as well as of the simple flake-like form, the whole group being the same as that of the valley of the Thames.

Similar traces of man living under similar conditions have been met with in the river-deposits over the greater part of northern and eastern England, from Chard [1] and Axminster on the west, to the Straits of Dover on the east, and from the Bristol Channel as far north as Cambridge. They are conspicuous by their absence from the gravels north-west of a line passing through the midland counties from Bristol to the Wash.[2]

[1] Evans, *Journ. Anthrop. Inst.*, May 1878.

[2] Mr. Evans' masterly work on *Ancient Stone Implements* will give the reader the details as to the forms and distribution of the implements in Britain.

Social Condition of the River-drift Man.

The Palæolithic implements in the late Pleistocene river-beds are rude and simple. They consist of the flake, the chopper or pebble roughly chipped to an edge on one side, the hâche, or oval pointed implement intended for use without a handle (Figs. 33, 37, 39), an oval or rounded form with a cutting edge all round, which may have been used in a handle, a scraper for preparing skins, and pointed flints used for boring. These are the principal implements in the late Pleistocene river-deposits, and although they imply that their possessors were savages like the native Australians, they show a considerable advance on the simple flake left behind as the only trace of man of the mid Pleistocene age. In this stage of culture man lived by hunting, and had not yet learned to till the ground, or to seek the materials out of which his implements were made by mining. He merely fashioned the stones which happened to be within his reach—flint, quartzite or chert—in the shallows of the rivers, as they were wanted, throwing them away after they had been used. In this manner the large numbers which have been met with in certain spots, such as Brandon in Suffolk, and Thetford, may be accounted for. Man at this time appears before us as a nomad hunter, poorly equipped for the struggle of life, without knowledge of metals, and ignorant of the art of grinding his stone tools to a sharp edge.

Range of River-drift Man on the Continent.

The researches of Boucher de Perthes and Rigollot in the fluviatile strata of the valley of the Somme at

Amiens and Abbeville, in the second quarter of the present century, prove that man lived in northern France surrounded by the same group of animals as in Britain. The identity in form of the implements, as pointed out by Mr. Evans and Mr. Flower, leaves no room for doubting that his culture also was of the same low order in Britain and in northern France. The discoveries of similar implements during the last twenty years have extended his range as far south as the deposits of the valley of the Garonne near Toulouse. We may therefore picture him as following the animals in their migrations, now retiring as far south as the Pyrenees, and now pushing as far north as the latitude of Peterborough. He must have found game in great abundance in the well-watered lowlands and round the numerous lakes, now covered by the North Sea and the English and Irish Channels.

The hunter has also left traces of his presence in Spain, in "a wedge-shaped implement unlike the ordinary European types, but similar to one of the Madras forms" (Evans), in the gravels of the Manzanares near Madrid, along with remains ascribed by Professor Lartet to the African elephant. In Italy an ovate implement of the ordinary form has been discovered near Gabbiano in the Abruzzo; and in Greece similar implements are said to have been obtained from beds of sand near Megalopolis, with bones of the great pachyderms.[1]

[1] See Evans, *op. cit.* p. 571; *Revue Archéol.* xv. 18. The tooth of the pigmy hippopotamus obtained by Dr. Rolleston, and said to have been found in a Greek tomb at Megalopolis, may have been collected from this spot, in which case that animal was a contemporary of man in that region.

River-drift Man in Africa, Palestine, and India.

The Palæolithic hunter of the River-drift has also left traces of his presence in Africa, at Ousidan near Tlemçen,

FIG. 37.—Quartzite Hâche, Narbadá, ½.

Oran, where implements of the type of St. Acheul (see Fig. 37), made of limestone and gritstone, have been

discovered by Dr. Bleicher in a rock-shelter.[1] He is proved to have lived in Palestine by the discovery, by the Abbé Richard,[2] of a flint implement of the ordinary river-bed type on the surface of a stratum of gravel between Mount Tabor and the Lake of Tiberias. He is also proved by the researches of Messrs. Bruce-Foote, King, Medlicott, and Ball,[3] to have wandered over the Indian peninsula from Madras as far north as the valley of the Narbadá, leaving behind in the gravels and brick-earths the same traces of his existence as in Europe.

He is further shown by the discovery of a quartzite implement, Fig. 37, by Mr. Hacket,[4] in the fluviatile strata on the left bank of the Narbadá, near the valley of Bhutrá, to have lived in northern India side by side with wild beasts now extinct, two kinds of elephant (*E. namadicus* and *E. stegodon insignis*), two species of hippopotamus, one (*H. palæindicus*) with four incisor teeth in front of the jaws as in the African, and a second (*Hexaprotodon*) with six incisors, and a large ox (*Bos palæindicus*). With these were associated the remains of a buffalo (*Bubalus namadicus*), identical with the wild arnee the ancestor of the Indian domestic breeds, as well as those of the gavial or long-snouted crocodile of the Ganges. Deer, bears, and antelopes were also represented.[5] From this imperfect list it is plain that at this time the fauna of northern India was

[1] *Matériaux*, 1875, p. 193. *Rev. Scient.* 15th February 1875. *Cave-hunting*, 429.

[3] *Quart. Geol. Journ. Lond.* 1868, xxiv. p. 503. *Proceed. R. Irish Acad.*, SS., vol. i. *Pol. Lit. and Antiq.* p. 389. *Int. Congr. Prehist. Archeol.*, Norwich, vol. 1868.

[4] *Records of Geological Survey of India*, vi. No. 3, 1873, p. 50.

[5] Falconer, *Palæontographical Memoirs, passim.*

related to the present fauna, just as the European fauna of the late Pleistocene is related to that now alive in Europe. In both regions there was a similar mixture of extinct and living forms; from both the genus hippopotamus has disappeared in the lapse of time, and in both man forms the central figure. Mr. Medlicott's conclusion, therefore, may be accepted, that the fauna of the Narbadá belongs to the late Pleistocene age in India.

Human Skeletons in River-deposits.

The bones of the River-drift man[1] are, as might be expected from the small size of human bones and the rarity of the hunters as compared with the enormous numbers of the animals on which they lived,[2] but very seldom met with in the river-deposits; and are so fragmentary as to give but little indication of his physique. Omitting those cases which are doubtful, the following examples may be quoted of the discovery of his remains. In 1867 a portion of a cranium was found at Eguisheim near Colmar by M. Faudel, along with the mammoth and other animals in the loam, proving that the Palæolithic hunter in the Upper Rhine possessed a skull of the long type (*Dolichocephalic*). In the following year at Clichy, in the valley of the Seine, a human skull and bones were obtained, by M. Eugene Bertrand, from a gravel-pit underneath undisturbed strata of loam, sand, and gravel, at a depth of 5·45 mètres from the surface,

[1] For an account of the human remains mentioned in this paragraph, see Hamy, *Paléontologie Humaine*, 8vo, 1870, p. 210 *et seq.*; and Quatrefages and Hamy, *Crania Ethnica*, 4to, Parts I.-IV.

[2] On the necessary rarity of the hunter as compared with the game see Sir John Lubbock, *Prehistoric Times*, 4th edit. p. 364 *et seq.*

along with the mammoth, woolly rhinoceros, horse, ox, and stag. The skull was long and with simple sutures, and the bones of the thigh and leg presented characters which are commonly met with in human skeletons of the Neolithic age, the *linea aspera* of the femur being enormously developed, and the tibia being flattened.[1] Other fragments found in the same pit, at a depth of 4·20 mètres, by M. Reboux, are considered by Dr. Hamy to belong to a broad-headed race, but the fragment of a frontal bone and of a lower jaw, upon which this conclusion is founded, seem to me too imperfect to afford decided evidence as to the shape of the skull. A human parietal and occipital have been obtained by the same discoverer at a depth of 4 mètres, at Révolte, also in the valley of the Seine.

Human bones have also been met with in the valley of the Somme; those discovered by M. Emile Martin at Grenelle, along with flint implements and the mammoth, belong to a long-headed race with large brain, identical, according to Dr. Hamy, with those interred at Cro-Magnon, in the valley of the Vezère. The flint implements found at Grenelle are considered by M. de Mortillet to belong to the same stage of culture as those of the Cave-men of Moustier.

No human skeleton of undoubted Pleistocene age has as yet been discovered in river strata on the continent sufficiently perfect to allow us to form an idea of the physique of the River-drift men, and no human bones have as yet been recorded from the fluviatile deposits of Great Britain. The few fragments, however, which remain to us, prove that at this remote period man was present in Europe as man, and not as an inter-

[1] *Cave-hunting*, pp. 173-9.

mediate form connecting the human race with the lower animals.

Relation of River-drift Man to the Glacial Phenomena.

The Palæolithic hunter of the mid and late Pleistocene river-deposits in Europe belongs, as we have already shown, to a fauna which arrived in Britain before the lowering of the temperature produced glaciers and icebergs in our country; he may therefore be viewed as being probably pre-glacial. When the temperature was lowest he probably retreated southwards, and returned northwards as it grew warmer, precisely in the same manner as the mammalia on which he depended for food. From these *à priori* considerations he may also be viewed as interglacial; but it must be remarked that the proof of this, brought forward by Mr. Skertchly[1] from his discoveries at Brandon and elsewhere in Norfolk and Suffolk, is still under discussion, and that it is not established by any other discovery, unless the lower brick-earths of Crayford and Erith be considered pre- or inter-glacial. He was, however, in this country after the retreat of the ice and the disappearance of the icebergs from the area of south-eastern England,

[1] *The Fenland*, by H. S. Miller and S. B. J. Skertchly, 8vo, 1878, p. 546; also S. B. J. Skertchly, *Mem. of Geol. Survey of Great Britain*. The strata containing the implements are considered by Professors Hughes and Bonney not to be of clearly ascertained inter- or pre-glacial age. Mr. Skertchly's conclusions are accepted by Professor Ramsay and Mr. Whitaker, and put by the prudent caution of Mr. Evans "to a suspense account." I feel inclined to accept the evidence brought before the British Association at Sheffield in 1879, founded on the sections at High Lodge, Culford, Mildenhall, West Stow, and Broomhill, in favour of man having lived in East Anglia before the upper boulder clay had ceased to be deposited.

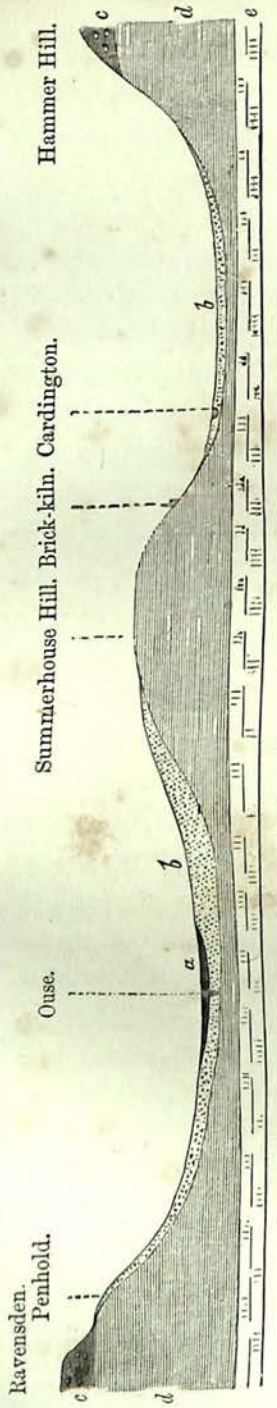


Fig. 38.—Section through the Valley of the Ouse.

a. Alluvium. *b.* Gravel with implements and mammals. *c.* Boulder clay. *d.* Oxford clay. *e.* Oolite.

as is shown by Prestwich, Lyell, Evans, and others.[1] In illustration of this, the observations made near Bedford by Mr. Wyatt may be quoted (Fig. 38). There flint implements occur in a series of fluviatile gravels in the valley of the Ouse, largely composed of materials derived from the destruction of the boulder-clay. This is the upper chalky boulder clay of Mr. Searles Wood, and out of this, as may be seen in the figure, the valley has been partly hollowed. Consequently the deposits within the valley, including the fluviatile gravels, are later than the boulder clay of the district. The same conclusion is indicated by the section at Hoxne, where fluviatile deposits with Palæolithic implements (Fig. 39) rest in a hollow of the clay, as pointed out by Prestwich and Lyell. In the Thames valley, also, and in the area to

[1] Wyatt, *Geologist*, 1861, p. 242. *Quart. Journ. Geol. Soc. Lond.* xviii. 113, xx. 183. Prestwich, *op. cit.* xvii. 362. Lyell, *Antiquity of Man*, 4th edit. p. 214 *et seq.*

the north, the valley gravels are composed to a considerable extent of *débris* washed out of the boulder clays,

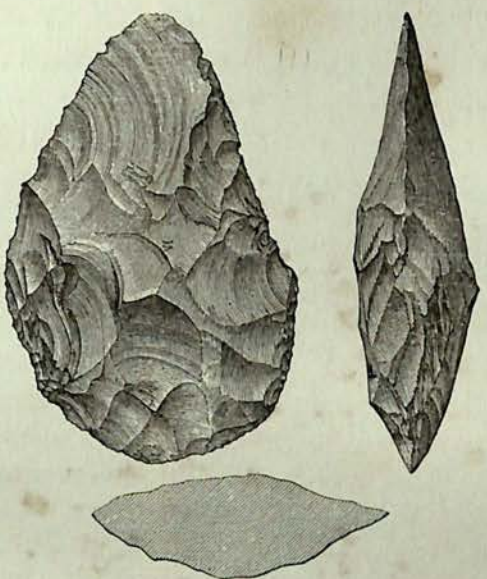


FIG. 39.—Flint Hâche, Hoxne, ½.

and are therefore later; some of the Palæolithic implements are made of ice-borne quartzites. It may therefore be concluded that man was probably pre-glacial and glacial in Europe, but certainly post-glacial in the area north of the Thames.[1]

[1] Dr. James Geikie's view (*The Great Ice Age*) that the Palæolithic river-strata are "interglacial," in the sense of belonging to a warm period intervening between two periods of extreme cold, is unsupported by any evidence except that of Brandon and the neighbourhood now under discussion. If that be allowed to pass unchallenged, it does not follow that the river strata containing similar remains in southern England and France are also "interglacial." It is probable that glaciers descended from the mountains of Scotland and of all the higher hills of Great Britain, then lifted up at least 600 feet above their present levels into the colder regions of the air, as well as from the Alps, Pyrenees, and hilly region of Auvergne, while the mammalia were living in the forests and prairies below; but there is no

The section, Fig. 38, is further remarkable, for the remains found in it are proof that man was a contemporary of the hippopotamus and the straight-tusked elephant, as well as of the urus and the reindeer, in the valley of the Ouse.

General Conclusions as to the River-drift Man.

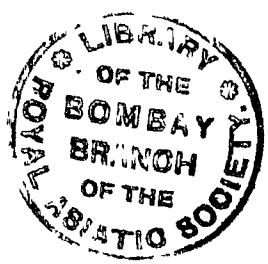
From the facts recorded in the preceding pages the reader will be able to gather that the River-drift man hunted the reindeer, and the other arctic animals, in southern England and in France, and that he was a contemporary of the African elephant in Spain, and possibly of the pigmy hippopotamus in Greece. It is also clear that he followed the chase over the Mediterranean area, where the only obstacles to his passage from Spain to Africa, from Calabria to Sicily, Malta, and Africa, or from the Peloponnese to Palestine, would be offered by the rivers and morasses (see Map, Fig. 24). It is impossible to doubt but that he wandered either from Palestine to India or India to Palestine. His implements throughout this wide region prove him to have been in the same low stage of culture, alike in the sombre forests of oak and pine in Britain, and when surrounded by the luxuriant vegetation of the Indian jungle. From this distribution over three continents it may be inferred that man was in this stage of culture for a very long period; for it would have been impossible for this culture to have been

proof that these animals were ever driven away from the lower grounds in the south of England or in France by the development of ice or by the extreme severity of climate. The severity of the winters during the sojourn of Palæolithic man in the valleys of the Somme and the Seine, is, however, as Prestwich has pointed out, proved by the large blocks of stone brought down by the ice and embedded in the gravel.

spread over such vast distances in a short space of time by wandering tribes.

Probably the centre from which these Palæolithic tribes swarmed off was the plateau of Central Asia, which in subsequent ages was the aboriginal home of the successive invaders both of Europe and India. We cannot refer them to any branch of the human race now alive, and they are as completely extinct among the peoples of India as among those of Europe. Their relation to the men who lived in the valley of the Thames in the mid Pleistocene age is doubtful.

The wide area occupied by this priscan population renders it very probable that it was not the same as that whose remains are chiefly met with in caverns in a limited area in Europe, and which can be identified with men now living on the earth, and whose implements are of a higher order. This question will be discussed in the following chapter, in which it will be seen that the River-drift men as well as the Cave-men used caverns for shelter in this country and in France, as is the universal custom among savages of the present day.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CHAPTER VII.

THE CAVE-MAN AND THE ADVANCE IN CULTURE.

The Caves of Cresswell Crags.—The Pin Hole.—The Robin Hood and Church Hole Caves.—The Three Pleistocene Strata.—The Lower Red Sand.—The Middle Cave-Earth.—The Upper Cave-Earth and Breccia.—The Oldest Fauna in the Cresswell Caves.—This Fauna in the Caves of Yorkshire.—The Caves of Castleton.—Migration of Bison and Reindeer.—Bison in the District in Summer, Reindeer in Winter.—Man present with the Hippopotamus and Leptorhine Rhinoceros in the Cave of Pont Newydd.—Palæolithic Men of the Caves of Devonshire.—The River-drift Men preceded the Cave-Men in the Caves of France.—M. de Mortillet's Classification.—Chronological Sequence, based on the Associated Mammalia, unsatisfactory.—Cave-Men throughout Europe in the same stage of Culture.—Range of the Cave-Men compared with that of the River-drift Men.—Civilisation of Cave-Men.—Dwellings.—Domestic Pursuits.—No Pottery.—Means of obtaining Fire.—Implement-making. Sewing.—Dress and Ornaments.—Hunting, Fowling, and Fishing.—Art.—Engraving.—Sculpture.—Skeletons of Cave-Men.—The Cave of Duruthy.—No Interments proved to be of Palæolithic Age.—Relation of Cave-Men to River-drift Men.—Cave-Men probably Eskimos.—Cave-Men not now represented in Europe.

CAVERNS and rock shelters have been used as habitations by man from the Pleistocene period to the present day, and the traces of this occupation present us with a vivid picture of the social condition of their inhabitants. They also contain the remains of animals which enable us to realise the corresponding changes in the animal life.

Just as they afforded shelter to the cave-bear and the hyæna in the Pleistocene age, so in the Prehistoric period did they to the wolf and the bear, and in modern times to the fox and the badger. The results of their exploration,[1] so far as they relate to the early history of mankind, may be conveniently laid before the reader by the light of the newest discoveries, made by the Rev. J. Magens Mello[2] and myself in a group of caverns on the north-east border of Derbyshire, at Cresswell Crags, about five miles to the south-west of Worksop.

The Caves of Cresswell Crags.

The low range of hills, passing from Yorkshire southwards into Leicestershire, composed of magnesian lime-

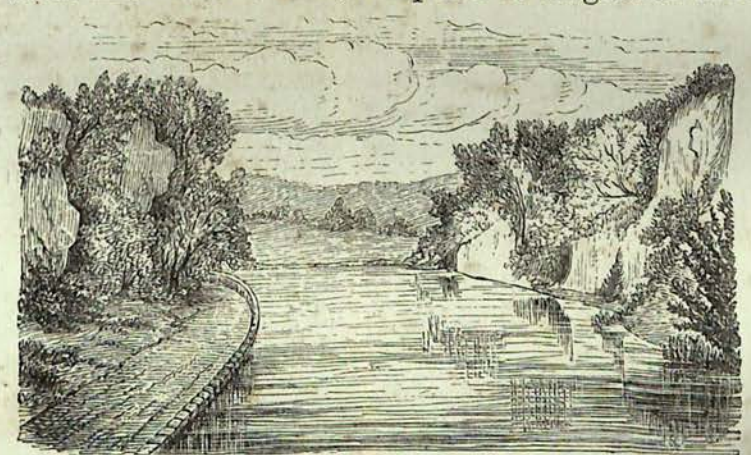


FIG. 40.—View of Cresswell Crags, looking east.

stone, is traversed here and there by ravines, among which that known as Cresswell Crags (Fig. 40) is one of

[1] The history of the exploration of caves is treated in my work on *Cave-hunting*, 8vo, 1875.

[2] *Quart. Journ. Geol. Soc. Lond.* xxxi. p. 679 ; xxxii. p. 240 ; xxxiii. p. 579 ; xxxv. June 1879.

the most beautiful and picturesque. It is about a third of a mile long, with the vertical cliffs on either side 50 to 80 feet high, overhung with ivy, and relieved by a luxuriant growth of hazel and maple, stunted oak and ash wherever the scree at the bottom, or the cracks in the surface, allow the vegetation to root itself. Through it flows a stream dividing the counties of Derby and Nottingham, which now forms the beautiful sheet of water filling the bottom of the ravine. Caverns and fissures open on it on either side—on the north the Pin Hole, the Robin Hood, and Mother Grundy's Parlour (on the left of Fig. 40), and on the south the Church Hole Cavern.

The Pin Hole.

The Pin Hole, so called from a curious superstitious custom of dropping a pin into a small water-filled hollow in it, and of taking away at the same time one left by a previous visitor,[1] first attracted the attention of the Rev. J. M. Mello in 1875. It runs some 40 or 50 feet horizontally into the rock, and was partially filled with sand containing blocks of stone and large quantities of remains of animals. The sand and pebbles had been introduced by a stream, the large blocks had fallen from the roof in the long course of ages, while the fossil bones and teeth were so scored with teeth-marks as to show that their owners had fallen a prey to some wild beast, which had eaten not merely their flesh but their marrow-containing bones. This creature is proved to have been the spotted hyæna by the numerous teeth and

[1] This singular custom is probably connected with the ancient practice of making offerings to the dead, and in later times to fairies, in little cups in stones (see Chap. IX.)

jaws in the cave, ranging from cubhood to old age. The victims identified by Professor Busk belong to the grisly bear, wolf, common fox, bison, reindeer, Irish elk, horse, woolly rhinoceros, and mammoth, to which must be added the arctic fox, so abundant in the Polar regions, and the glutton or wolverine, ranging from the Polar regions as far south as the forests of Germany. The arctic fox is new to Britain, although it has been discovered in the caves of France, Germany, and Switzerland; and the glutton has only been previously met with in the cave of Plas Heaton, near St. Asaph.[1] In these remains we have the materials for forming an idea of the animals living in the woodlands of Yorkshire, Derbyshire, and Nottinghamshire. We may picture to ourselves the horses, bisons, and reindeer trooping down to drink, with here and there an Irish elk, or an unwieldy mammoth or rhinoceros. The drinking-places were the chosen haunts of packs of hyænas, by which even large and powerful creatures, such as grisly bears and rhinoceroses, were overwhelmed, and their remains carried piecemeal into the dens, to be devoured at leisure.

The Robin Hood and Church Hole Caves.

Man is proved to have formed the central figure in this very remarkable assemblage of animals, by the numerous implements and articles left behind in the chambers and passages of the Robin Hood cavern, or that next explored, which were filled with strata in the following order:—

[1] Dawkins, *Quart. Journ. Geol. Soc. Lond.* xxvii. p. 406.

The Three Pleistocene Strata.

The floor was covered with a dark layer of earth, some five or six inches in thickness, containing fragments of Roman and mediæval pottery, and other remains of

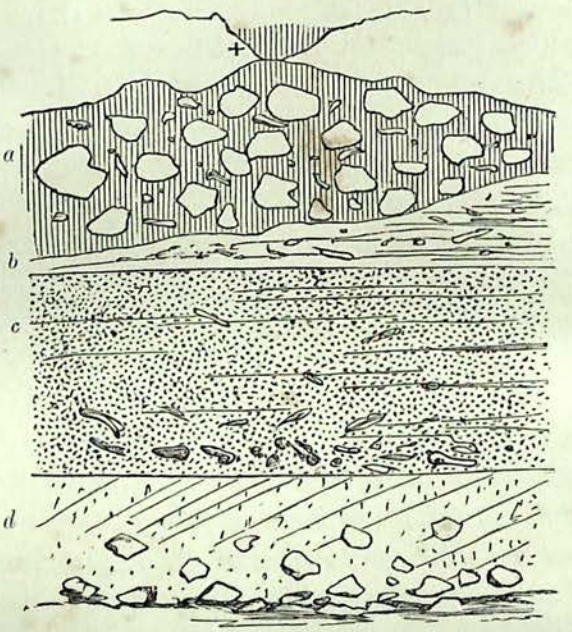


FIG. 41.—Strata in Robin Hood Cave.

+	Stalactite uniting roof to breccia.	
a.	Stalagmitic breccia with bones and implements	0 to 36 inches.
b.	Cave-earth with bones and implements . .	21 to 52 ,,
c.	Red clayey sand	24 to 48 ,,
d.	Light-coloured sand with limestone blocks, about	24 ,,

Historic age. Below this (Fig. 41, *a*), on the left-hand side, was a layer of breccia three feet thick, and sufficiently hard to be blasted only with extreme difficulty. In other parts of the cave it diminished in thickness, and passed into thin stalagmite. It will be observed in the section that it stands in an inverse ratio in regard of thickness to the cave-earth below, *b*, containing bones, which was

present in every part of the cave, and is at its thinnest in the above figure, its average being three to four feet. From this it may be concluded that while the breccia was being formed by calcareous infiltration in one part of the cavern, the upper part of the cave-earth was being accumulated in another, and that therefore, in point of time, the breccia and the upper portion of the cave-earth must be viewed as contemporaneous deposits.

The cave-earth rested upon a red sand, *c*, containing clay in its lower parts, underneath which was a light-coloured sand with limestone fragments, *d*, resting on the rocky floor, and devoid of traces of man or of the wild animals. These ossiferous strata are repeated in the Church Hole Cave in the same order. We shall treat them historically, beginning with the oldest and the lowest.

The Lower Red Sand.

The red sand, *c*, the lowest bone-bearing stratum, contains remains of the same species as those already mentioned from the Pin Hole; the lion, however, must be added to the list, as well as the wild boar and the brown bear. With few exceptions the animal remains are marked by teeth of the hyænas, but they were not so closely eaten up as they usually are in hyæna dens, probably because of the abundance of food in the neighbourhood. Unexpected evidence of the presence of man in the cave at this time is offered by five pebbles of quartzite, used for hammers or pot-boilers, and three splinters of the same material, identical with those so numerous in the cave-earth immediately above. They show that savages of a low order came to the district from time to time, following the chase of the reindeer, bison, mam-

moth, and other animals found in this stratum, and seeking shelter in the cave. The hyænas were the normal inhabitants, and returned to their dens when man forsook them. In this manner the intimate association of human implements with the tooth-marked fragments left by the hyænas may be explained, not only in this, but in the succeeding strata.

The red sand furnished implements and the same group of animals in the Church Hole, as well as in Mother Grundy's Parlour.

The Middle Cave-Earth.

The second stage in the history of the occupation of the caverns by man is marked by the lower and middle portions of the cave-earth, *b*, which contained enormous quantities of bones and teeth of animals introduced by the hyænas, as well as bones broken by the hand of man, fragments of charcoal and implements of flint and quartzite amounting to not less than eleven hundred. The quartzite implements had been manufactured out of pebbles, in which advantage had been taken of the smooth surface to form one side of the cutting edge, and some had probably been intended for the preparation of skins, like those in use in 1873 among the Shoshones of north-western Wyoming. "The Shoshones," writes Captain Jones, "though mostly provided with tools of iron and steel

FIG. 42.—Quartzite Flake, Robin Hood Cave, ½.
a. Section.

of approved patterns, are still to be seen employing as a scraper in the dressing of skins a mere 'teshoa,' consisting of a small worn boulder thinner at one end, and split through the middle in such a manner as to furnish a rough cutting edge on one side. There seems to be a considerable advantage," he adds, "in this over any form of knife or other tool which has as yet reached them from without, and it is probable that it will be re-

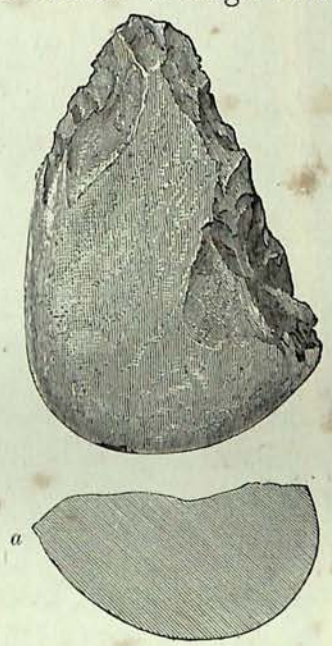


FIG. 43.—Quartzite Hâche, Robin Hood Cave, ½.
a. Section.

FIG. 44.—Oval Quartzite Implement, Robin Hood Cave, ½.
a. Section.

tained as long as their present method of preparing hides is in vogue."[1] There were also quartzite flakes (Fig. 42) and implements of the same rude forms as those described from the river gravels. In Fig. 43 we see a pebble chipped into the same form as those found at S. Acheul, and, like them, evidently intended to be held in the hand by the broad end, while in Fig. 44 we see another of a different form also belonging to the River-

[1] *Reconnaissance of North-Western Wyoming*, 1873, p. 261.

drift type, in which a pebble has been chipped to a cutting edge all round. This form is repeated in ironstone,

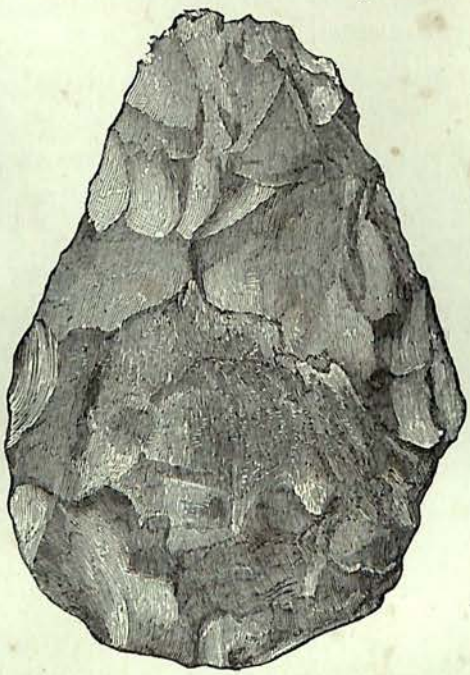
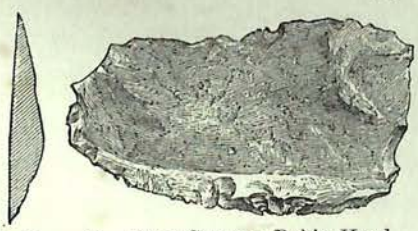


FIG. 45.—Ironstone Implement, Robin Hood Cave, ½.

in which material the characteristic oval-shaped hâche (Fig. 45) has also been fashioned. Numerous quartzite pebbles also, with one end chipped to an edge, had probably been used as choppers for breaking up bones.



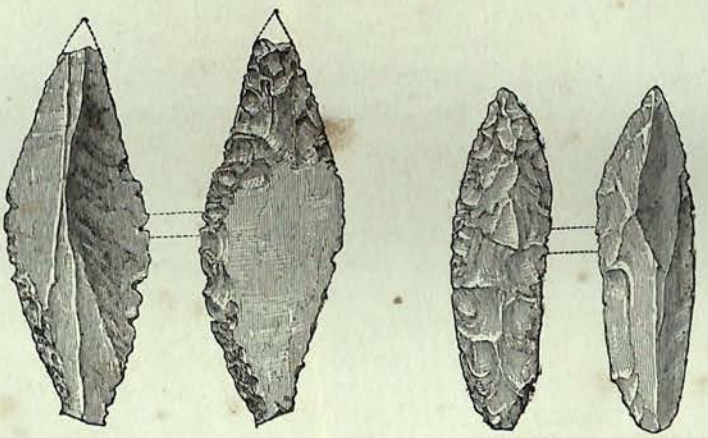
a FIG. 46.—Flint Scraper, Robin Hood Cave, ½. *a*, Section.

Flint flakes and chips appear in the lower part of the cave-earth, and scrapers, one of which (Fig. 46) is a flake with its edge carefully and minutely chipped, very like one from Kent's Hole, Fig. 392 of Mr. Evans' work on *Ancient Stone Imple-*

ments. Thus we see that the implements are composed of three materials, of which the quartzite pebbles and the ironstone nodules are to be found in the neighbourhood, while the flint pebbles have been brought a distance, probably from some one of the gravels in the valley of the Idle, a small river flowing into the Humber.

The Upper Cave-Earth and Breccia.

In the third period in the Palæolithic history of the cavern, or that of the breccia, *a*, and the upper part of

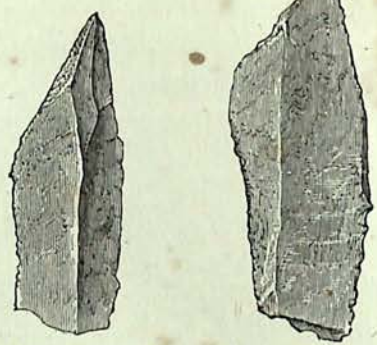


FIGS. 47, 48.—Lancecolate Flakes, Breccia, Robin Hood Cave, ½.

the cave-earth, the rude tools of quartzite found below are replaced by more highly finished articles of flint brought from a distance, such as lance-heads (Figs. 47, 48), trimmed flakes, and a flint borer (Fig. 49). In the upper cave-earth were simple and double scrapers, and numerous small flakes (Figs. 50, 51). Some of these had obviously been let into a handle of wood or some other perishable material, by which the edge of one side

had been protected, while the other was worn away

FIG. 49.—Flint Borer, Breccia, Robin Hood Cave, ½.



FIGS. 50, 51.—Worn Flakes, Breccia, Robin Hood Cave, ½.

by use (Fig. 52), as is the case with some of those dredged up from the bottom of the Swiss lakes, still

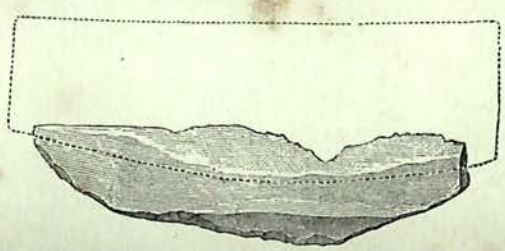


FIG. 52.—Worn Flake, Cave-earth, Church Hole, ½.

remaining in their handles. A fragment of bone, ornamented with the chevron pattern, as well as a bone awl, were also found.

The most important discovery, however, made at this horizon is that of a small fragment of rib, with its polished surface ornamented with the incised figure of a horse (Fig. 53); the head, with its eyes, mouth, and nostrils, is admirably drawn, and a series of fine oblique lines stopping at the bend of the back, proves that the animal was hog-maned. It is the first instance of the

discovery of the figure of an animal in this country, and it is of high value, as we shall see presently, in bringing

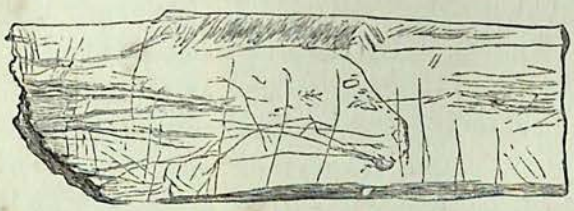


FIG. 53.—Horse, Upper Cave-earth, Robin Hood Cave, ¼.

the Cave-men of Britain into relation with those of France, Belgium, and Switzerland.

In the upper cave-earth of the Church Hole a bone needle (Fig. 54), a bone awl (Fig. 55), a peculiar notched

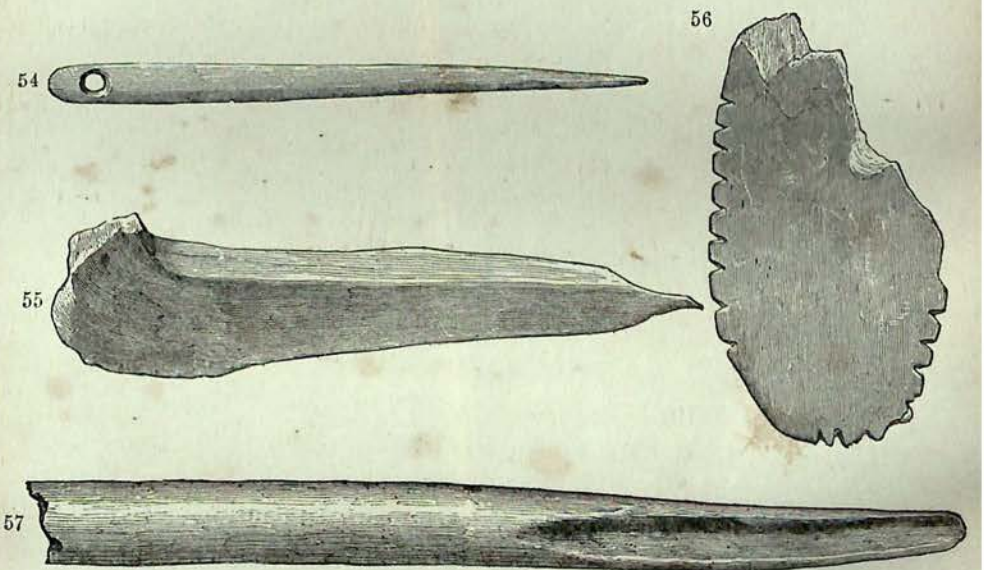


FIG. 54.—Bone Needle. FIG. 55.—Bone Awl. FIG. 56.—Notched Bone.
FIG. 57.—Rod of Reindeer Antler. Church Hole Cave, ¼.

plate of bone (Fig. 56), and a rod of reindeer antler terminating in a scoop (Fig. 57), were discovered in association with similar flint implements.

The results of the exploration of these caves, so far as they bear on the history of man, may be summed up as follows. In the two lower stages, *b* and *c*, the hunters are identical with those of the river-drift, while the more highly-finished articles, which imply a higher, and probably a different, social condition, appear in the upper series, and are therefore later in time.

The oldest Fauna in the Cresswell Caves.

The association of species in the strata of these caverns does not present any decided points of contrast, although it must be noted that in the Robin Hood cave, the leopard, and the sabre-toothed lion (*Machairodus*

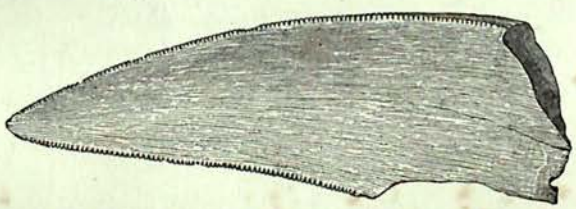


FIG. 58.—Upper Canine of Machairodus, Robin Hood Cave, ½.

latidens) (Fig. 58), were found in the upper cave-earth, but along with the more common animals. The exploration, however, of a fourth cave, termed Mother Grundy's Parlour, by the Rev. J. M. Mello and myself in November 1878, has revealed an earlier chapter in the history of the caves of Cresswell Crags. Underneath the lower red sand, *c*, the lowest ossiferous layer in the other caverns, was a layer of red clay, varying in thickness from six inches to three feet, and resting on a ferruginous yellow sand a foot thick. In both these the remains of hyænas were very abundant, bisons were present, and the molar teeth, tusks, and other remains, proved that at least

three hippopotami had fallen victims to the hyænas, as well as several rhinoceroses of the small-nosed or leptorhine species of Owen. The last two animals are new to the district. No implements were found at this horizon, and there is therefore no proof that the Palæolithic hunter was a contemporary of these two animals in the district. Nor have the reindeer, the woolly rhinoceros, and the mammoth, so abundant in the other caves of Cresswell Crags, left any trace of their having invaded the district at the time of its occupation by the leptorhine species and the hippopotamus.[1]

This Fauna present in Caves of Yorkshire.

The same animals as those of the lower strata in Mother Grundy's Parlour have been found in several caverns in the north of England, in the hyæna den at Kirkdale, explored in 1822, as well as in the Victoria Cave near Settle, and the Raygill Cave near Skipton. In these the hippopotamus occurs along with hyæna and the straight-tusked elephant (*E. antiquus*), and in the two first also in association with the leptorhine rhinoceros and the reindeer. In none is there any trace of Palæolithic man.[2]

[1] For the details of this discovery, see *Quart. Journ. Geol. Soc. Lond.* xxxv., June 1879.

[2] The occurrence of Palæolithic man in the Victoria Cave, considered by Mr. Tiddeman to be pre- or inter-glacial, is founded on a misapprehension. The bone supposed to be human turns out to belong to a bear, and the cut bone said to have been found in an undisturbed layer in association with the extinct mammals, has probably been cut with an edge of metal, and belongs to a domestic sheep or goat, animals as yet unknown in Europe before the Neolithic age. It is also identical in its recent condition with numerous other bones of the same species cut in

The Caves of Castleton and Matlock.

The same group as those from the lower red sand, middle cave-earth, and upper breccia, has recently been met with in the caves of Derbyshire, at Matlock Bath, by Mr. Robert Law,[1] and in the Peak cavern in a fissure at Windy Knoll, near Castleton. From the last Mr. Rooke Pennington[2] and myself obtained no less than 6800 specimens, irrespective of fragments thrown aside, belonging principally to the bison and reindeer, together with bears, wolves, foxes, and hares. This vast accumulation of bones, in an area not more than 25 by 18 feet, had been formed in the bottom of a swallow hole (Fig. 59), used as a drinking-place by migratory bodies of animals. It is about 1600 feet above the sea, at a point in the Pennine chain where the magnificent

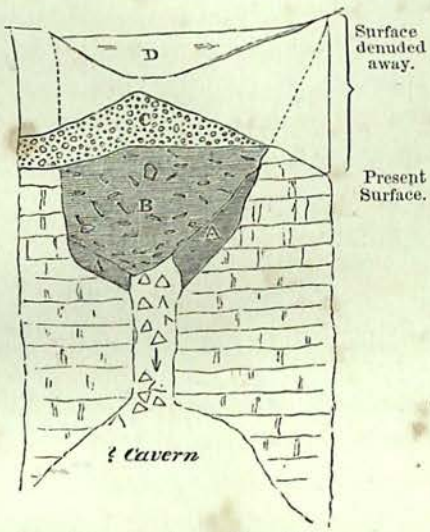


FIG. 59.—Ossiferous Deposit at Windy Knoll.

A. Yellow loam without bones, 4 feet.
B. Yellow clay with blocks of stone and bones, 8 feet.
C. Clayey débris, 6 feet.

the same way, left behind in the cave not earlier than the fifth or sixth century after Christ. Both it and the other bones of sheep or goat were probably involved in the clay in one of the frequent slips which took place while the work was going on, and by which similar bones were let down from the refuse-heap above while I was conducting the first part of the exploration. See reports on Victoria Cave, *Brit. Ass. Reports*, 1870-78.

[1] *Trans. Manchester Geol. Soc.* xv. p. 51.

[2] *Quart. Journ. Geol. Soc. Lond.* xxxi. p. 246; xxxiii. p. 724.

ravine of the Wynnetts and the pass by Mam Tor lead from the vale of Hope and Castleton into the plains of Cheshire and Lancashire, and it evidently marks the route by which the animals passed to and fro from one set of pastures to another, after the manner of the bison in North America and the reindeer in Siberia.

Migration of Bisons and Reindeer.

The bisons in North America, so rapidly disappearing —like the Red Indian—at the advance of the white man, are described as forming herds of enormous size, going wherever instinct leads them in search of pastures, "now through the dark gorges of the Rocky Mountains, now trailing into the valleys of the Rio del Norte, now pouring down the wooded slopes of the Saskatchewan." "Nothing could stop them on their march; great rivers stretched before them with steep overhanging banks, and beds treacherous with quicksands and shifting bar; huge chasms and earth rents, the work of subterranean forces, crossed their line of march, but still the countless thousands swept on. Through day and night the earth trembled beneath their tramp, and the air was filled with the deep bellowing of their unnumbered throats. Crowds of wolves and flocks of vultures dogged and hovered along their way, for many a huge beast half sunk in quicksand, or bruised and maimed at the foot of some precipice, marked their line of march like the wrecks lying spread behind a routed army."[1] The bison are also described, by the Northern Boundary Commissioners, as wintering in vast herds in the fertile grass lands of Dakota. They were shot from the waggons with pistols, and pressed in such numbers upon the party that the

[1] *Wild North Land*, Major Butler, p. 53.

march was stopped. In every pond their skeletons were to be seen, and in one ravine they lay five deep. Grisly bears, wolves, and foxes abounded in the neighbourhood.[1]

Admiral von Wrangell[2] gives a graphic account of the migration of reindeer observed in his journey through the stony Tundra, near the river Baranicha in north-eastern Siberia. "I had hardly finished the observation," he writes, "when my whole attention was called to a highly interesting, and to me a perfectly novel spectacle. Two large migrating bodies of reindeer passed us at no great distance. They were descending the hills from north-west and crossing the plain on their way to the forests, where they spend the winter. Both bodies of deer extended farther than the eye could reach, and formed a compact mass narrowing towards the front. They moved slowly and majestically along, their broad antlers resembling a moving wood of leafless trees. Each body was led by a deer of unusual size, which my guides assured me was always a female. One of the herds was stealthily followed by a wolf, who was apparently watching for an opportunity of seizing any one of the younger and weaker deer which might fall behind the rest; but on seeing us he made off in another direction. The other column was followed at some distance by a large black bear, who, however, appeared only intent on digging out a mouse's nest every now and then—so much so that he took no notice of us."

[1] *Times*, 31st October 1874. For a further account of bison see J. A. Allen, "History of American Bison," *Ninth An. Rep. of U.S. Geolog. and Geograph. Survey of the Territories*, 1875.—*Mem. Mus. Comp. Anat. Harvard Coll. Cambridge, U.S.*, iv. No. 10.

[2] *Narrative of an Expedition to the Polar Sea in* 1820-23, translated by Major Sabine.

Bisons in District in Summer, Reindeer in Winter.

We can readily picture to ourselves, by the aid of these two narratives, the vast migratory bodies of bison and reindeer, a sea of tossing manes and horns, or a moving forest of antlers, passing upwards by the great gaping chasm, overhung by the Peak Castle, to the heights dividing the tributaries of the river Trent from those of the Dee and the Mersey, followed by the wild beasts as in North America and Northern Asia. The bison and reindeer, however, now are not known to inhabit the same country at the same time, and therefore we cannot suppose that this was the case in Britain in the Pleistocene age. The difficulty may be explained by the supposition that they occupied the district at different seasons, which, as we have already seen, were more sharply contrasted than they are at the present time. An examination of their bones and teeth proves that the bisons were here with calves not more than three or four months old, that is to say, within three or four months of calving time in May, in other words, in the summer and the autumn. The remains of the young reindeer, on the other hand, are very scarce, and only one milk-molar, the last in the series, possesses imperfect fangs; from which it may be concluded that they were not in the district in the summer and autumn —their calving time, according to Sir John Richardson,[1] also being May. They were, therefore, here in the winter time, and perhaps in the early spring. This undesigned piece of evidence is a strong confirmation of the truth of the views held by Sir Charles Lyell and myself that the association of animals, not now found together in Pleistocene deposits, is due to seasonal migrations.

[1] *Fauna Boreali-Americana.*

Man present with Hippopotamus in Cave of Pont Newydd.

Palæolithic man has left no traces of his presence in the caves of Castleton and Matlock. They have, however, been met with in several caverns in Wales, such as those of Pembrokeshire and Monmouthshire in the south, and in that of Pont Newydd,[1] near St. Asaph in North Wales. In the latter a human molar tooth has been found, as well as a quartzite implement, and rude splinters and chips of quartzite, of the same type as those of the red sand in the caves of Cresswell. The pebbles of which these are made have been obtained from the glacial deposits in the neighbourhood. We may therefore conclude with Professor Hughes, that the Palæolithic hunter was here after the district was forsaken by the glaciers and the sea, or in other words, in post-glacial times, as in the parallel case offered by the river-deposits of Bedford and Hoxne. It must also be remarked that the leptorhine rhinoceros and the hippopotamus, as well as the straight-tusked elephant (*E. antiquus*), bear, bison, reindeer, and horse, are found with the quartzite implements in the Pont Newydd cave, which may therefore be classified with those of Yorkshire and the lower strata in Mother Grundy's Parlour.

With this exception, the association of traces of man with the remains of hippopotamus has, as yet, not been observed in any bone caves either in this country or on the Continent. The presence of the leptorhine rhinoceros, hippopotamus, and straight-tusked elephant, probably marks the earliest phase of the occupation of the caves of Europe by the Palæolithic hunter.

[1] *Cave-hunting*, viii.

Palæolithic Men of the Caves of Somerset.

The caverns of the Mendip Hills,[1] which have furnished a rich series of remains to the Rev. D.

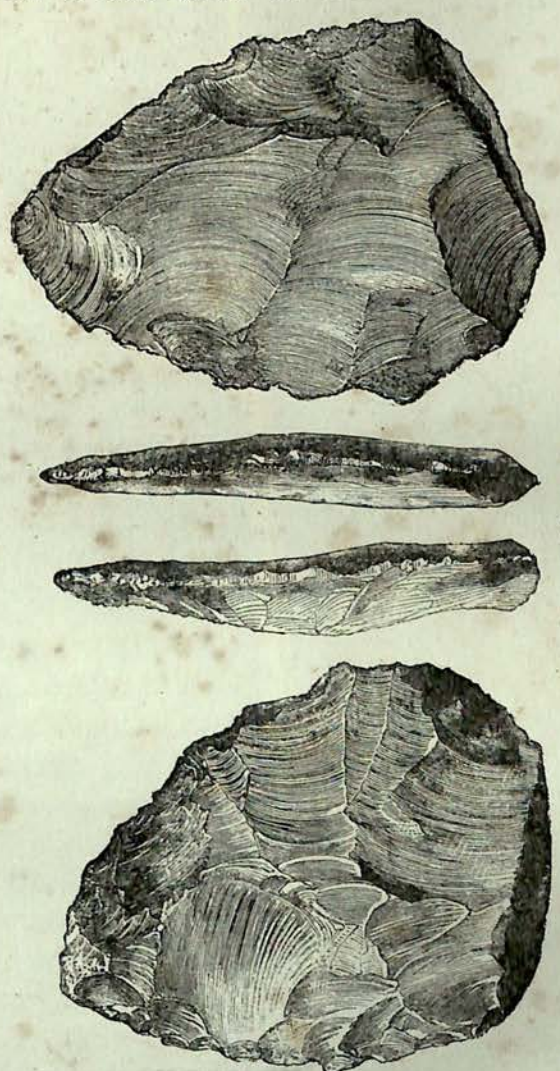


FIG. 60.—Flint Implements, Wookey Hole, near Wells, ½.

[1] *Cave-hunting*, viii.

Williams, Messrs. Beard, Ashford Sanford, and myself, have presented in Wookey Hole traces of the Palæolithic man of the higher strata of the Cresswell caves, in several well-trimmed flakes and well-chipped oval implements of flint (Fig. 60), along with the same group of animals.

Palæolithic Men of Kent's Hole.

The first evidence that there were in the caverns of this country two distinct sets of Palæolithic implements, is that presented by Kent's Hole, so ably explored under the superintendence of Mr. Pengelly.[1] In the lowest strata of crystalline breccia are rude implements of the River-drift type (Fig. 61), in association with the remains of bear, out of one canine tooth of which animal a flake had been manufactured, presenting all the ordinary conchoidal fracture of flint. It had been made after the tooth had become fossilised. "The implements found in the breccia," Mr. Pengelly remarks, were "exclusively of flint and chert. They

FIG. 61.—Flint Hâche, Breccia, Kent's Hole, ½.

[1] *Brit. Ass. Reports*, 1864-78.

were much more rudely formed, more massive, less symmetrical in outline, and made by operating not on flakes but directly on nodules, of which portions of the original surface generally remained, and which were probably derived from supra-cretaceous gravels existing in great volume between Torquay and Newton Abbot, about four miles from the cavern. It is obvious, however, that even such tools could not be made without the dislodgment of flakes and chips, some of which would be capable of being utilised, and accordingly a few remnants of this kind were met with in the breccia, but they were all of a very rude simple character, and do not appear to have been improved by being chipped."[1]

Above the breccia is the cave-earth, in which flint

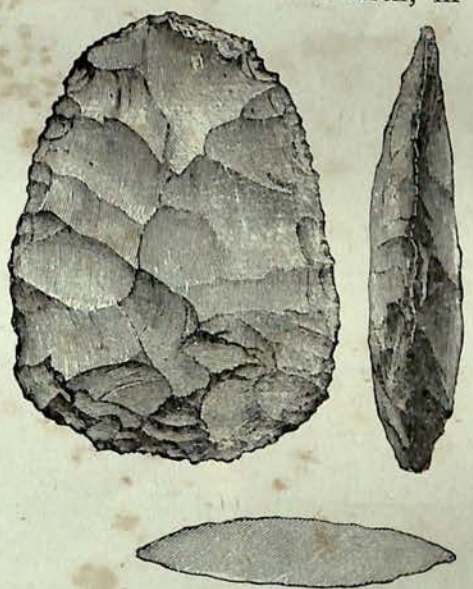


FIG. 62.—Oval Implement, Cave-earth, Kent's Hole, ½.

implements are by far more numerous and of a higher

[1] *Journal of the Plymouth Institution*, February 18, 1875, pp. 17, 18.

form, some being carefully chipped all round and oval, as in Fig. 62, while others are lanceolate (see Figs. 47, 48) and may have been intended for spear or javelin heads) There were also carefully-trimmed flakes (Fig. 63) and scrapers, both single and double, and hammer stones (Fig. 64). A bone needle also was met with, and bone awls, and two harpoons of reindeer antler, the one barbed on one side (Fig. 65), and the other on

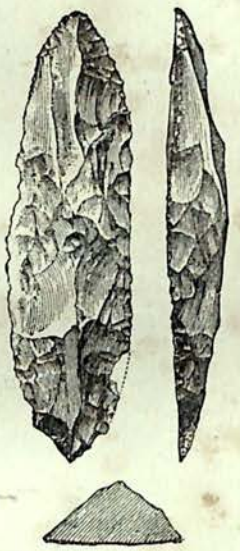


FIG. 63.—Trimmed Flake, Cave-earth, Kent's Hole, ½.

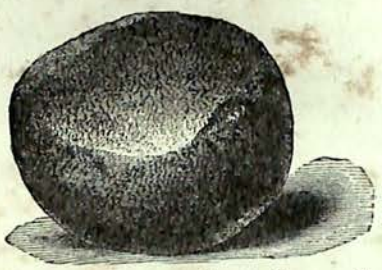
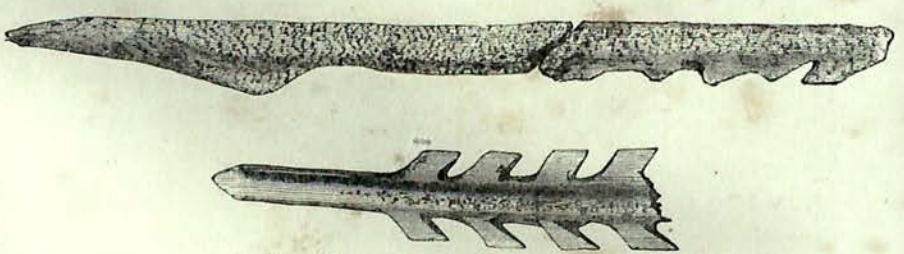


FIG. 64.—Hammer-Stone, Cave-earth Kent's Hole, ½.

both sides (Fig. 66). With the exception of the two last, these implements are identical with those described



FIGS. 65, 66.—Harpoon-heads, Cave-earth, Kent's Hole, ½.

in the preceding pages from the breccia and upper cave-earth of the Cresswell caverns. The two deposits in Kent's Hole are separated from each other by a sheet of

crystalline stalagmite, in some places nearly 12 feet thick, "formed after the materials of the breccia were deposited, but before the introduction of the cave-earth commenced. After the stalagmite just mentioned, it was in extensive parts of the cavern broken up by some natural agency, and much of the latter, if not of both, was dislodged and carried out of the cavern before the first instalment of cave-earth was deposited."[1] We may therefore conclude that the interval was long enough to allow of great physical changes in the district, by which the contents of the caverns were affected. An[2] implement of the River-drift type, similar to Fig. 61, has been discovered in the famous cave at Brixham, explored also under the superintendence of Mr. Pengelly. And it may most probably be referred to the same early stage as those from the breccia in Kent's Hole.

The River-drift Men preceded the Cave-men in the British Caves.

From these observations it is evident that the River-drift men inhabited the caves of Devonshire, Derbyshire, and Nottinghamshire, in an early stage of the history of caverns, and that after an interval, to be measured in Kent's Hole by the above-mentioned physical changes, the Cave-men found shelter in the same places. The former also followed the chase in the valley of the Elwy and the vale of Clwydd in North Wales, and the latter found ample food in the numerous reindeer, horses, and bisons then wandering over the plains extending from the Mendip Hills to the Quantocks, and the low fertile

[1] *Journal of the Plymouth Institution*, February 18, 1875, pp. 17, 18.

[2] See Evans, *Ancient Stone Implements*, p. 468, Fig. 409.

tract now covered by the estuary of the Severn and the Irish Sea (Fig. 32). When all these facts are taken into consideration, it is difficult to escape Mr. Pengelly's conclusion that the two sets of implements represent two distinct social states, of which the ruder is by far the more ancient.[1]

The River-drift Men preceded the Cave-men in the Caves of France.

These two stages of culture have been recently proved by the researches of Dr. M. J. Parrot to be equally represented in Central France. In the Grotte de l'Eglise at Excideuil (Dordogne)[2] the strata containing the remains of Man were in the following order:— 1st, At the bottom of the cave a yellow sand contained rough choppers and rude flakes "of jasper," and other simple forms of the same kind as those in the red sand of the Cresswell Caves, and like them unaccompanied by any higher forms. They were associated with the bones of the bear and bison, the former of which, as we have seen in the preceding paragraphs, is characteristic of the lower breccia in Kent's Hole. 2d, Above this was a layer of red earth, with implements of the same sort as those below, and composed of the same material, but accompanied here by a few simply chipped implements of the type of Moustier. At this horizon the reindeer, cave-bear, and horse were discovered. 3d, A layer of black earth underneath a sheet of stalagmite formed the upper layer, in which the implements are of a far higher order: those of flint consisting of flakes, saws, and

[1] *Brit. Ass. Rep.* 1873, p. 203.

[2] *Revue d'Anthropologie*, T. iii., Nouvelle Note sur la Grotte de l'Eglise à Excideuil, par Dr. M. J. Parrot.

scrapers, with finely-chipped lance-heads and arrow-heads, similar to those from Cresswell Crags (Figs. 47, 48) and Solutré; and those of bone and antler being awls and arrow-heads. At this horizon implements of jasper were exceedingly rare, a core and an arrow-head being the only two mentioned by the discoverer. The animals used for food at this time were principally reindeer, but there were also the remains of horses, a large ox, and a carnivore.

These three stages form an exact parallel to those of Cresswell, and imply that in Central France as in England the most ancient cave-dwellers were in a lower state of civilisation than their successors, and that the sequence of events in England, established by the caves of Cresswell and Kent's Hole, applies equally well to the caverns of the Continent. The ruder and more ancient stage of culture is identical with that of the River-drift men, while the higher and newer belongs to that of the Cave-men properly so called.

The Subdivisions of the Palæolithic Age proposed by M. de Mortillet.

Before we treat of this higher civilisation it will be necessary to give an outline of the classification of the remains from the caverns and river-beds given by the eminent archæologist M. de Mortillet,[1] by whom they are divided into four stages:

1. That of the river-drift of St. Acheul, or the "Epoque Acheuléen," defined in the last chapter as the age of the River-drift man.

[1] Mortillet, *Classification des Diverses Périodes de l'Age de la Pierre*, Congr. Int. d'Anthrop. et d'Archéol. Préhist., Brussels, vol. 1872. Evans, *Ancient Stone Implements*, p. 433 *et seq.*

2. That of the cave of Moustier, or the "Epoque Moustérien," characterised by the presence of flakes worked on one side only, and, according to Mr. Evans, of choppers and ovato-lanceolate implements, somewhat like those of the preceding stage No. 1. In England implements of these forms occur in the cave-earth of Cresswell Crags, of Kent's Hole, and of Wookey Hole.

3. That of the "station" or camping-ground of Solutré,[1] or the "Epoque Solutrien," in which elaborately

FIG. 67.—Flint Arrow-head, Laugerie-Haute, ½.

FIG. 68.—Flint Javelin-head, Laugerie-Haute, ½.

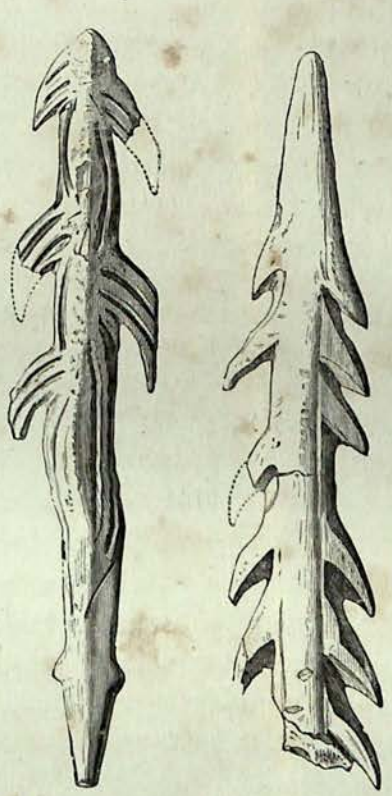
FIG. 69.—Bone Needle, La Madelaine, ½.

chipped lance-heads (Figs 67, 68), and leaf-shaped im-

[1] *Materiaux*, 1868 *passim*, 1869 p. 469.

plements, and scrapers are found, similar to those figured from the upper strata in the Cresswell Caves.

4. That of the rock-shelter of La Madelaine in the Dordogne, or the "Epoque Magdalenien," characterised by the numerous saws, scrapers, and borers of flint, and by a great quantity of implements of various sorts



FIGS. 70, 71.—Harpoon-heads of Antler, La Madelaine, ½.

FIG. 72.—Harpoon-head, Gorge d'Enfer, ½.

fashioned out of bone and antler, such as bone needles (Fig. 69), harpoons (Figs. 70, 71, 72), and sketches upon antler, bone, stone, and ivory, such as those figured in the following pages. This stage is characterised by the de-

velopment of the manufacture of bone implements and the decay of that of stone.

These divisions, to a large extent based on the improvements observable in the various sets of implements, are not sharply defined from each other, the first one excepted, and cannot, in Mr. Evans' opinion, at present be regarded as absolutely established.[1] The men who used elaborately chipped lance-heads of the "Epoque Solutrien" used implements identical with those of Moustier, as well as articles of bone and antler like those of La Madelaine, and were also acquainted with the art of engraving the figures of animals. With regard to the two last divisions which are represented in the valley of the Vezère, the view of Professor Edward Lartet[2] that they belong to the same phase of the human period, is probably true, since there is but little difference between the animals found in them, and since the difference in the human implements may be accounted for by the unequal distribution of articles in use at the same time, as well as by there having been different centres of manufacture. On examining the principal collections in France, it seems to me that this explanation may be extended so as to cover the "Epoque Moustérien" as well as those of Solutré and La Madelaine, and I am able to recognise merely local differences, due probably to tribal isolation, or to abundance of stone or antler, between the contents

[1] *Ancient Stone Implements*, p. 439.

[2] Lartet, *Cavernes du Périgord, Rev. Archéol.* 1864. Lartet and Christy, *Reliquiæ Aquitanicæ*, 4to. Ducrost et Lartet, *Station Préhistorique de Solutré, Archiv du Mus. de Lyon*, 1872, l. i. Pl. 1. The researches of Dr. M. J. Parrot into the caves and rock-shelters of the Vezère prove that some cannot be classified with any of these divisions, which he therefore views merely as useful aids in the inquiry, but in no sense final. *Bull. Soc. Anthrop. de Paris*, 22d January 1873.

of the caves of the three last stages. The differences are of the same order as those observed by Arctic explorers among various tribes of Eskimos, some of which are rich and admirably equipped for the battle of life, others poor, and without the higher forms of implements and weapons: but nevertheless all their implements are to be referred to the same race, and to be grouped together as belonging to the same stage of culture.

Cave-Men throughout Europe in the same stage of Culture.

Nor are there any periods in the history of the Palæolithic caverns of Belgium,[1] Germany, or Switzerland, well defined by different implements or by different mammalian species. In them the characteristic implements of the three later ages of M. de Mortillet occur in the same strata, in association with the remains of the same animals, and therefore must be referred to the same people in the same stage of culture as that observed in the caves of France and Britain.

Chronological Sequence based on the Mammalia unsatisfactory.

Nor does an appeal to the variations presented by the fauna aid us in making a chronological sequence, as I have shown in my work on *Cave-hunting*, for the hunters in each district would live on whatever animals they could catch, and the abundance of reindeer in one cave, as compared with that of horses or cave-bears in

[1] Dupont divides the caves of Belgium into those of the "Age du Mammoth" and "Age du Renne." These animals, however, occur in both series.

another, implies merely a local variation in the fauna. One Eskimo camping ground of the present time is covered with bones of walrus and seal, and another with the remains of musk sheep and reindeer, according to the prevalence of those animals in their respective districts. The remains of the late Pleistocene mammalia occur in the caves of France and of Britain in such an intimate association with the works of man, that no classification based on the mammalia is possible. This view, it must be remembered, is held also by M. de Mortillet.

Range of the Cave-Men compared with that of the River-drift Men.

The remains of the Cave-men are found throughout the whole of France, and are remarkably abundant in the caverns of the Pyrenees. In Belgium they have been proved by the discoveries of M. Dupont[1] to be equally abundant in the valleys of the Meuse and of the Lesse. In Switzerland they have been met with in the caverns of Veyrier[2] on the Salève, of Thayingen[3] near Schaffhausen, and in various caverns in Germany as far south as Styria.[4] In Germany, as Professor Fraas points out, the Cave-men frequently hunted the grisly bear as well as the extinct cave-bear. As yet they are unknown in

[1] *L'Homme pendant les Ages de la Pierre dans les Environs de Dinant-sur-Meuse*, 2d edit., 1872.

[2] A. Perrin, *Étude Préhistorique sur la Savoie*, texts 8vo, plates 4to, 1871, p. 2.

[3] Conrad Merk, *Excavations at the Kesslerloch, near Thayingen, Switzerland*, transl. by J. E. Lee; Longmans, 1876.

[4] Oscar Fraas, *Die Alten Höhlenbewohner. Sammlung Gemeinverständlicher Wissenschaftlicher Vorträge*, vii. serie, Heft 168. Von Gundaker Graf Wurmbrand, *Ueber die Höhlen und Grotten in dem Kalkgebirge bei Peggau* (Styria), 8vo, 1871.

the caves south of the Alps and the Pyrenees and north of a line passing east and west from Derbyshire through Belgium. Thus we see that their range is limited as compared with that of the men of the river-drift, and it coincides with the middle zone represented in Fig. 24, in which the remains of northern and southern animals occur. Men inhabited caves outside these limits in the Pleistocene age, such as those of Palermo, in which Dr. Falconer[1] discovered flint flakes in association with the pigmy hippopotamus (*H. Pentlandi*), but they did not use the implements characteristic of the Cave-men as described in this chapter.

From this distribution of the implements it is evident that the Cave-man belongs neither to the southern group of the Pleistocene animals (see Fig. 24), nor to the temperate which found its way over the mountain barriers into Spain, Italy, and Greece. On the other hand, the River-drift man must be considered as a member either of the temperate or southern fauna of Europe, because his remains are met with in the regions of the Mediterranean, north of those mountain barriers. This difference in the range is an important link in the chain of evidence, by which it will be shown that the men of the River-drift differed in race from those of the caves. Before this can be examined we must give an outline of the civilisation of the Cave-men.

The Civilisation of the Cave-Men.—Dwellings.

The numerous remains in caverns in the area defined in the preceding paragraphs, and the comparison of the implements with those of lowly civilised tribes now

[1] Grotta di Maccagnone, Falconer, *Pal. Mem.* ii. 546.

living, enable us to throw our minds back into those remote times, and realise the life and surroundings of the Cave-man. We will first deal with his dwellings.

The place for an encampment was generally chosen either under the shelter of a rock or at the mouth of a

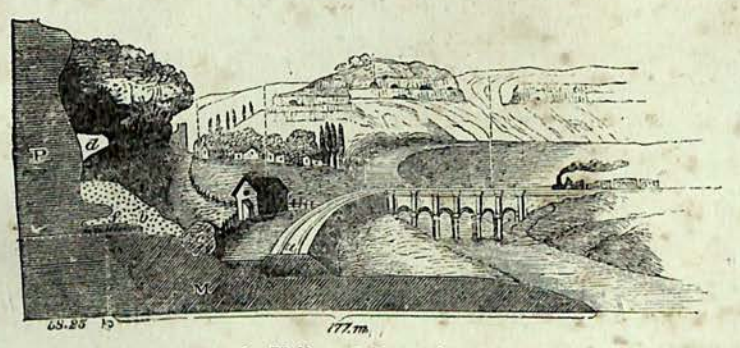


FIG. 73.—Section across the Valley of the Vezère, through the Rock-Shelter of Cro-Magnon.

cavern, and in some cases, as, for example, in that of Cro-Magnon[1] in the valley of the Vezère (Fig. 73), the same spot was inhabited from time to time for a long series of years, until it was no longer habitable from the accumulations on the floor. In Fig. 74, the letters B, D, F, H, and J, represent successive deposits of charcoal, flint implements, and broken bones, which have resulted from successive occupations, continued until the *débris* reached to within about a foot of the roof. This section is further interesting because it shows the true relation of the human bones, *b d*, to the Palæolithic refuse-heaps. It will be seen that they rest at the further end of the cave in *débris* overlying the refuse-heaps, and that therefore they are later than the Palæo-

[1] Lartet and Christy, *Reliquiæ Aquitanicæ*, 4to, p. 66.

lithic occupation of the cavern, to which they are con-

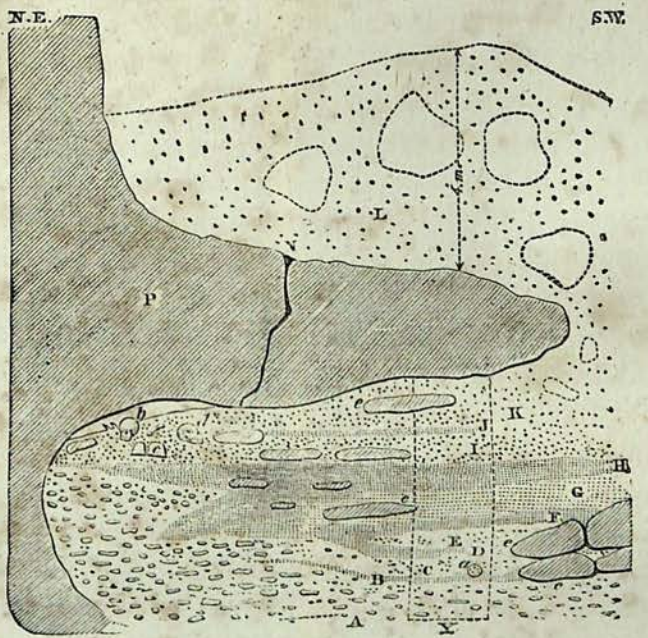


FIG. 74.—Detailed Section of Cro-Magnon.

sidered to belong by M. Louis Lartet and the editors of *Reliquiæ Aquitanicæ*.

These caverns and rock-shelters are to be looked upon as places of periodic resort, like the winter huts of the Eskimos, between Eschscholtz Bay and the river Mackenzie. That this was the case, at all events in Great Britain, is proved by the intimate association of the gnawed bones of animals brought in by the hyænas, with the traces of human occupation which has been pointed out in the Cresswell caves. When a cave was deserted by man, it was immediately taken possession of by the wild beasts whom he had temporarily dislodged.

The Cave-men did not always use caves and rock-shelters for their camps. The large accumulations of

refuse at Solutré[1] in the valley of the Saone, above Lyons, and the implements at Chez-Pourré, in the commune of Brive,[2] show that encampments were found in the open air close to water at the same spot year after year. The habit of camping in the open air must have been the rule rather than the exception, because caverns and rock-shelters are only met with in very limited areas, and generally at some distance from the most fertile plains, where game would be most abundant. The rarity of subaerial refuse-heaps compared with those in caves and under rocks may be explained by the greater liability of the former to be destroyed by the rain, frost, and other atmospheric agents, even wearing away or rearranging the surface soil. Probably the huts were formed of branches of trees, or of skins, like the summer tents of the Eskimos; and the same materials may have been used for making the caves and rock-shelters more comfortable.

Domestic Pursuits.—No Pottery.

From these refuse-heaps we can make out the domestic pursuits of the Cave-men as distinguished from their hunting, fowling, and fishing. The game brought home to the rock-shelter or cavern was either roasted or cooked by means of hot stones or "pot-boilers." Flint flakes were used for dividing the meat, and the bones were broken for the sake of the marrow. Some of the scoops (Fig. 56) have probably been used as marrow spoons.

1 Lartet and Ducrost, *Sur la Station Préhistorique de Solutré, Archives du Museum de Lyon*, t. i. p. 1.

2 M. Lalande, *Matériaux* (1869), p. 458. This "station" has furnished the same spear-heads, scrapers, and choppers, as those of the caves of the Cresswell Crags.

The vessels for holding water were probably made of wood, and skin, and horn, of which last material the bison, the urus, and the musk sheep would offer a plentiful supply, but of these perishable substances no trace has been preserved. They may also have made vessels for containing fluids after the manner of the Eskimos by cementing pieces of stone together with a mixture of fat and lamp-black. There is no reason to suppose that they used vessels of pottery, since no potsherds have been discovered in any of the refuse-heaps which have been carefully explored in France, Germany, Switzerland, and Britain. The round-bottomed vase from the Trou du Frontal, considered by M. Dupont to imply that the art of pottery was known at this time, is of the same fashion as those of the Neolithic age from the pile dwellings of Switzerland, and probably belongs to that age. The potsherds found in the cave of Kuhlock are also of the same make as the Neolithic pottery, and the same remark applies equally to most if not all the cases of its occurrence quoted by Mr. J. C. Southall[1] from France, such as Bruniquel and others. Had the Cavemen been acquainted with the potter's art, there is every reason to believe that traces of it would be abundant in every refuse-heap, as they were subsequently in those of all pottery-using peoples, a fragment of pottery or of burnt clay being as little liable to destruction as a fragment of bone or antler. The absence of Palæolithic pottery in the French caves is confirmed by the wide experience of MM. Massenat, Lalande, and Cartailhac, who write as follows: "La poterie, nous saisissons l'occasion de le dire n'a jamais été trouvée par nous dans les couches franchement, intacte de l'âge du renne. Elle

[1] *The Recent Origin of Man*, 8vo, 1875, p. 195 *et seq.*

accompagne constamment, au contraire les ossements d'animaux domestiques, elle est l'œuvre des populations de l'âge de la pierre polie et sa présence dans un gisement quaternaire (palæolithic) est pour nous une signe de remaniement."[1]

Means of obtaining Fire.

In all probability the Cave-man obtained fire by the friction of one piece of hard wood upon another, as is now the custom among many savage tribes. Sometimes, however, as in the Trou de Chaleux, quoted by M. Dupont,[2] he may have obtained a light by the friction of a bit of flint against a piece of iron pyrites, as is usual with the Eskimos of the present day.

Implement-Making.—Sewing.

The occupations which centred then, as now, round the hearth, were for the men the manufacture of articles for the chase, and for the women the preparation of food and clothing. Flint and chert pebbles were collected and fashioned into various articles (see preceding figures in this chapter), near the fires;—into spear-heads, such as (Figs. 47, 48), arrow-heads, flakes, borers, and saws for cutting antlers and bones;—into needles, spear-heads, and harpoons. The skins of the wild animals were prepared for clothing and other purposes, and sewn together with a thread of reindeer sinew.[3] This was most probably the duty of the women. Some of

[1] *Matériaux*, 1871, p. 225.

[2] *Les Temps Préhistorique en Belgique*, 2d edit. p. 153.

[3] This is proved by the marks of cutting on the bones of the feet, pointed out by Prof. Ed. Lartet.

the outlines incised on the antlers in the caves of Auvergne represent the skin stretched out after it had been removed from the body of the animal, the incision being made, as at the present time, from the lower jaw to the tail, and the legs and tail being preserved.[1] The fashioning of wooden handles for the implements with their imperfectly edged tools must have occupied a large portion of the time of the men in the intervals of hunting.

Dress and Ornaments.

Their clothes were made of the furs of the various animals, reindeer, bisons, horses, and others, sewn together with sinews like those of the Eskimos, and their

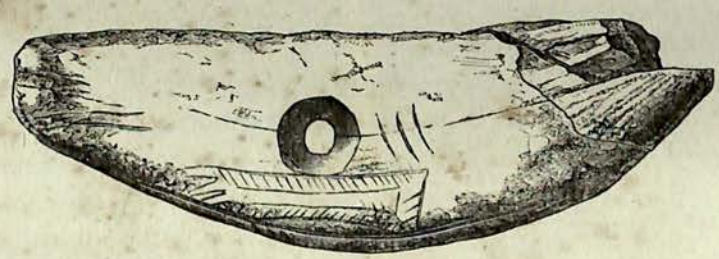


FIG. 75.—Glove on perforated Canine of Bear, Duruthy Cave, ½.

arms and hands were protected by long gloves with three or four fingers. Sketches of these incised on bone and antler have been discovered in caves in Auvergne and in the Pyrenees (Fig. 75). They probably painted their faces with red oxide of iron, lumps of which have been found in the English, French, and Swiss caves, and they wore amulets and necklaces made of perforated shells, both fossil and recent, of bone

[1] See *Rel. Aq.*, B. Pl. ix. Fig. 4, and B. Pl. xxiv. Fig. 8.

ivory, and teeth. Some of these were composed of canines of bear and lion (Fig. 76), of which no less

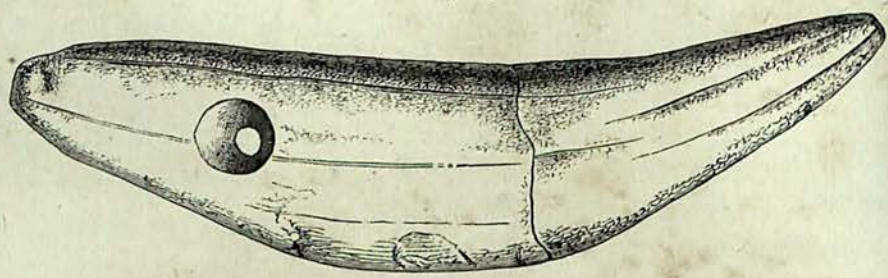


FIG. 76.—Tooth of Cave-lion, Duruthy Cave. ½.

than forty were found in the cave of Duruthy variously engraved (see Figs. 75, 76, 82, 84), forming a magnificent trophy of the chase.

Hunting.

The animals hunted by the Cave-men in northern and central France were principally reindeer, horses, and bisons, and occasionally mammoths, woolly rhinoceroses, cave-bears, uri, musk sheep, and ibexes. The hunters were armed with spears tipped with flint and bone (Figs. 47, 48, 63, 65, 66, 68), with daggers of reindeer antler, some bearing beautifully-carved handles, as well as with bows and arrows. The accompanying sketch,[1] incised on a piece of antler, left behind by one of the hunters in his dwelling at Laugerie Basse (Fig. 77), and figured by M. Massenat, shows that the game was sometimes stalked. A large ox is represented feeding, with his head down, while behind a naked human figure, with dishevelled hair and beard, has crept up, and is in the act of throwing a spear. The victim is considered by

[1] *Matériaux*, 1869, p. 348, Pl. 33, Fig. 1.

M. Massenat to be a bison, but the double curvature, as well as the length of the horns, prove that it was the urus,

FIG. 77.—The Hunting of the Urus, Duruthy Cave, $\frac{1}{2}$.

an animal which was hunted in the forests of Aachen (Aix la Chapelle) by the Emperor Charles the Great in the ninth century after Christ. Another hunting scene[1]

[1] *Rel. Aq.*, B. Pl. 2, Fig. 8.

has been preserved in the rock-shelter of La Madelaine, in which the hunter (Fig. 78), also naked, but standing

FIG. 78.—The Hunting of Bisons and Horses, La Madelaine, ½.

up, is in the act of striking a horse with something in his right hand which is probably intended for a spear. He has evidently surprised a herd, and the head of the horse which he is attacking has its ears pricked up in a very significant fashion. The figure to the left is probably an eel. On the other side of the rounded antler two bisons' heads are drawn with remarkable spirit, their simply curved short horns offering a great contrast to those of the urus of the preceding figure. Although in both these sketches the hunter is represented naked, it is impossible to suppose that he did not use the skins of animals for clothing in a climate such as that of France and Britain at the time. In the winter, at all events, we must picture him clad in furs.

The game was also probably caught sometimes by means of sharp-pointed stakes, by which the animals were impaled. One of these scenes is represented in a sketch from La Madelaine.[1] At other times they were entrapped between barriers, either natural or artificial.

[1] *Ib.* B. Pl. 2, Fig. 5.

In Fig. 79 a group of reindeer is represented, of which two are walking, while three others lie on their backs

FIG. 79.—Group of Reindeer.

with their heads in the air. This sketch is probably intended to show a successful hunt in which a portion of a herd was captured. Sometimes the hunter ran great risk in the attack of the larger animals, and in one figure engraved on a fragment of reindeer antler in the refuse-heap of Laugerie Basse, he has conveyed to us in a few masterly lines the impression made upon his mind by the charge of an elephant, trunk in air, and with mouth wide open (Fig. 80).

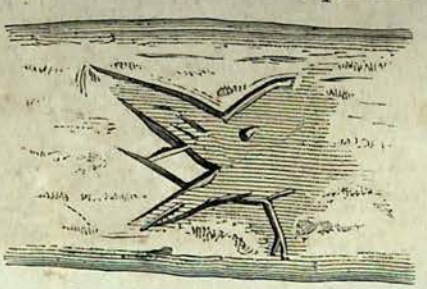


FIG. 80.—Mammoth charging, Laugerie Basse, ½.

The Cave-men dared also to attack the wild beasts which were their rivals in the chase. In a sketch in the caves of Dordogne, representing the outlines of a glutton,[1] we have evidence that that animal was familiar

[1] *Rel. Aq.*, p. 209.

to them in Auvergne; and in another, from the cave of Massat (Arriège) (Fig. 81), that the cave-bear was equally known to them in the valleys of the Eastern Pyrenees. Vast quantities of broken and split bones in the German caves show that the latter animal formed a large portion of his food in Germany. Among the

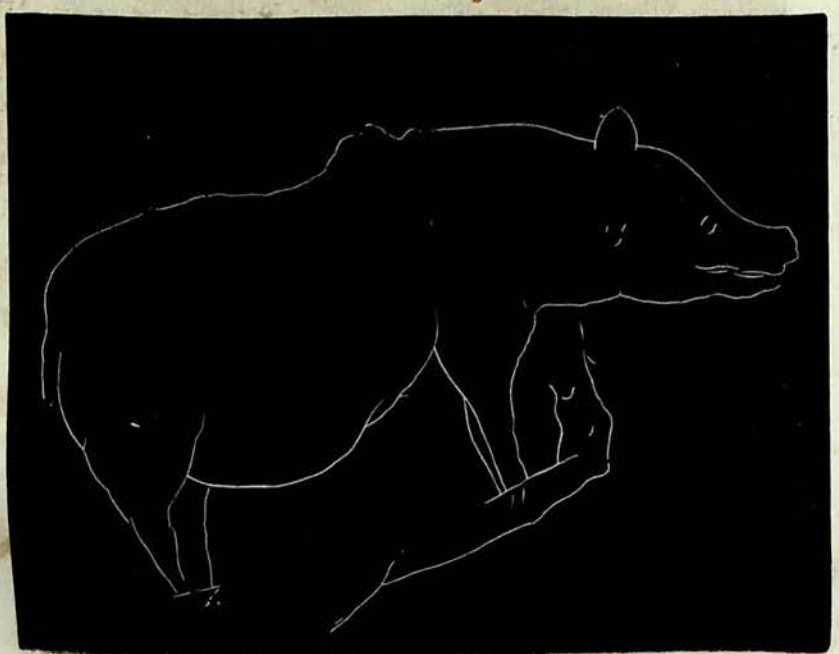


FIG. 81.—Cave-Bear incised on fragment of Schist, Bas-Massat, ½.

perforated teeth found in the cave of Duruthy are canines of the great cave-lion (Fig. 67). The body must have been cut up, and probably also to a large extent eaten on the spot after the capture of the larger game. For this reason the remains of the mammoth and woolly rhinoceros would naturally be rare in refuse-heaps composed of bones of smaller animals, and to a far less extent of those of the larger, which from their

bulk could not be carried. The portions carried off would be cut away from the larger bones. We can picture to ourselves the camp round the carcases, and the fires kindled not merely to cook the flesh, but to keep away beasts of prey attracted by the scent of blood. The tribe assembled round, and the dark trunks of the oaks or Scotch firs lighted up by the blaze, with hyænas lurking in the background, are worthy of the brush of a future Rembrandt. No dogs were used in the chase, and there is no trace of any other domestic animal.

The Cave-men depended mainly for their sustenance on the supply of reindeer and the other animals mentioned above; but when they had an opportunity they attacked the animals living in the sea. In the cave of Duruthy, explored by MM. Louis Lartet and Chaplain Duparc, near Sorde, in the valley of the Gave d'Oloron,

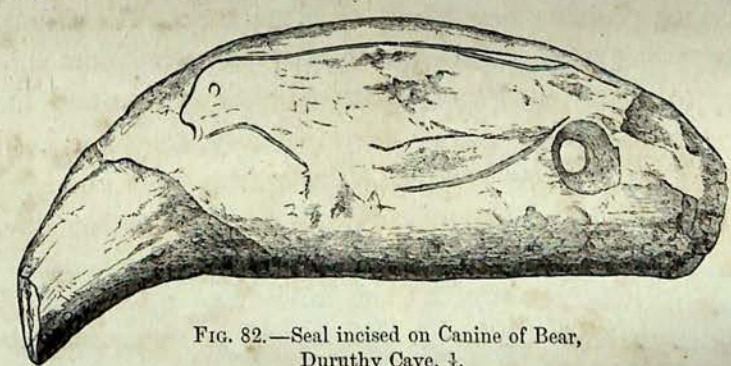


FIG. 82.—Seal incised on Canine of Bear, Duruthy Cave, ½.

in the Western Pyrenees, the figure of a seal is engraved on the canine of a cave-bear, which has been perforated for use as an ornament (Fig. 82), and a rounded fragment of antler from Laugerie Basse carries the outlines of a whale (Fig. 83), either the cachalot or sperm whale (*Cetodon macrocephalus*), or possibly the black fish

(*Physeter tursio*),[1] in which the large head and the position of the pectoral and dorsal fins are very well

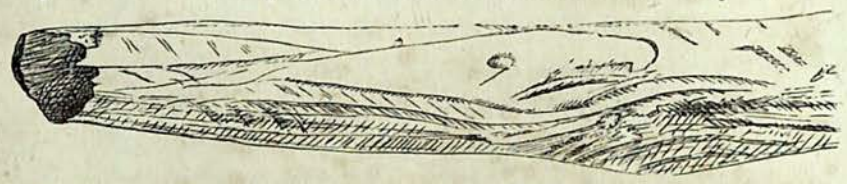


FIG. 83.—Whale incised on piece of Antler, Laugerie Basse, ½.

indicated. The seals were probably stalked, and the whale was caught on the nearest coast in the Bay of Biscay. We can realise the scene of gluttony which followed the slaughter of whales from the behaviour of the Eskimos under similar circumstances.

The absence of the remains of seals and whales from the refuse-heaps now within a short distance of the sea is due to the fact that in the late Pleistocene age the Atlantic seaboard was situated far to the west of its present position (see Maps, Figs. 24, 32). The refuse-heaps accumulated near the ancient shore are now submerged between the one hundred fathom line and the present coast. There, in all probability, they consisted of as large a percentage of seals, whales, and walruses, as those of the littoral Eskimos of the present day. The hunters who engraved these marine animals carried their sketches along with them in their migration inland, in the one case as far as Oloron, and in the other into Auvergne.

Fowling.

The Cave-men were expert fowlers, as is shown by the many kinds of birds identified by Professor Alfonse Milne-Edwards,[2] from the refuse-heaps of Central and

[1] Compare the figures given by Rev. J. G. Wood of the recent whales, *Natural History*, pp. 531, 535.

[2] *Rel. Aq.*, p. 226.

Southern France. Among them the most important are the snowy owl, now mainly confined to the cold climate of the north, where it feeds on lemmings and various small birds; the willow grouse, also an Arctic species; the ptarmigan, now living in the High Alps and Pyrenees as well as in the Arctic regions; the capercailzie and the grey partridge, the wild duck, and an extinct kind of crane (*Grus cinerea*). A group of birds, probably ducks, unable to fly, and scuttling away as fast as possible, is represented on a rounded lance-head from La Madelaine.[1] The moulting season is the chief time for fowling among the Eskimos of the present day. The birds were probably shot with arrows or taken with snares, or with barbed spears, such as those of the Eskimos (see Fig. 90). Some of the barbed arrow or spear points, so commonly found in the caves of France, have most probably been employed for this purpose, as well as for fishing (Figs. 65, 66, 70, 71, 72).

Fishing.

The fishes[2] which were caught with barbed spears of the kind noticed above, were the salmon, trout, carp,

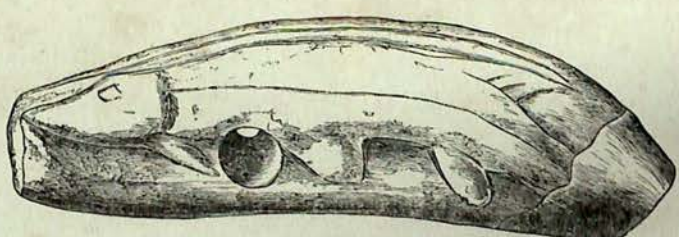


FIG. 84.—Pike incised on Canine of Bear, Duruthy Cave, ½.

bream, dace, chub, and pike, of which one engraving has

[1] *Rel. Aq.* Pl. 24, Fig. 5.

[2] *Ib.* p. 219.

been handed down to us on a canine tooth of a bear (Fig. 84) in the refuse-heap in the Duruthy cave.

The Art of the Cave-men—Engraving.

The Cave-men have left behind, as we have seen in the last pages, more vivid pictures of their life and times than those founded upon implements and weapons and the associated animal remains. Fortunately for us they employed the intervals of leisure from the chase in engraving upon bone, antler, and more rarely on ivory and stone, the hunting scenes which most vividly impressed themselves upon their memory. In the caves at Cresswell the figure of a horse (Fig. 53), delicately incised on a fragment of rib, is the first trace of the art of design in this country, proving that the faculty of representing animals, so wonderfully developed among the Cave-men of France, was shared also by those of Britain. The horse, it will be observed, has an upright or hog mane, and a large coarse head. The animal is frequently represented in a similar manner on bone and antler in the caves of France. In La Madelaine, for example,

FIG. 85.—Horses incised on Antler, La Madelaine, ½.

two horses (Fig. 85) are seen, with hog-manes and large heads, and with tails rough and tangled. Sometimes their heads are small and the necks long, as in those found in the Kesslerloch cavern. A hunting scene, in

which horses are the victims, has been already brought before the reader in treating the methods employed for taking the game (Fig. 78), as well as two others, in which the game consists of uri and reindeer (Figs. 77, 79). The last animal, as might be expected from the abundance of its bones in the refuse-heaps, was more often depicted by the hunter than any other. Sometimes it is drawn in groups, as in Fig. 79, and in others

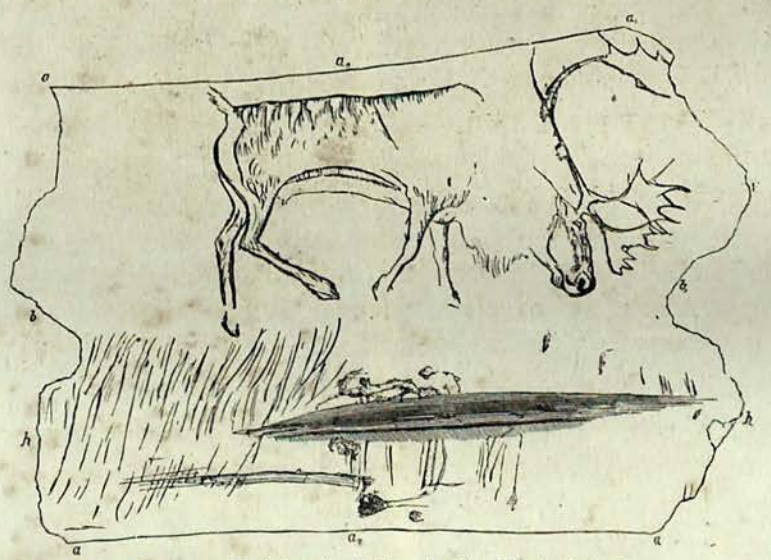


FIG. 86.—Reindeer incised on Antler, Kesslerloch, $\frac{2}{3}$.

singly. In Fig. 86 we see a buck, with its head down grazing, without thought of the hunter, who has handed down the attitude to us on a portion of antler found in the cave of Kesslerloch,[1] as the highest example of Palæolithic art as yet discovered. It is the only attempt at representing the herbage as well as the animal.

[1] Merk, *Excavations at the Kesslerloch near Thayingen*, transl. by J. E. Lee, 1876. Heim, *Mit. der Antiq. Gesellsch. in Zurich*, xvii. p. 125. Fig. 86 is taken from Prof. Heim's careful sketch.

The outlines of other animals, such as the stag, the great Irish elk with its huge palmated antlers, the ibex with its gracefully recurved horns, and the mammoth, have been met with in the caves of France, besides the bisons, seals, and birds already mentioned. In the figure of the mammoth the artist has seized the salient points with wonderful fidelity (Fig. 22); the spiral curvature of the tusks, the long hairy ears, and the long mane, which, had it not been for the discovery of the carcases preserved in the frozen morasses of Siberia, we should say were fictitious, because they are unlike those of any living species of elephant. In another example already mentioned (Fig. 80) the head of a charging elephant is most admirably engraved. The head of a brown bear is represented on a piece of antler from the cave of Bas-Massat, and on a fragment of schist from the same cave are the well-defined outlines of a species probably identical with the great cave-bear (Fig. 81). Sometimes the outlines of skins stretched out to dry are recognisable, and more rarely those of flowers and leaves (Fig. 91). The last occur in the caves of Belgium, France, and Switzerland. The human figure was but rarely sketched by the Cave-men, and that given in Fig. 77, in the hunting of the urus, is the most artistic as yet discovered.

Some of the vertical incised lines, and more especially those in the sketch on a piece of antler from the rock-shelter of Laugerie Basse, described by the Abbé Landesque,[1] may show that the inhabitants of Europe, in the late Pleistocene age, had their bodies more densely covered with hair than is usually the case at the present time. The protection from the cold which we and our

[1] *Matériaux*, 1874; p. 276.

ancestors for countless generations have obtained by the use of clothes, would render a natural clothing of hair unnecessary, and produce the present comparatively hairless condition of our bodies. Nevertheless there are numerous cases of reversion to the original hairy condition, such as that of the Ainos, in northern Japan, and of the hairy Siamese family,[1] described by Mr. Darwin.

Sculpture.

The Cave-men were also acquainted with the art of sculpture. In the cave of Laugerie Basse, the handle

FIG. 87.—Handle of Dagger, Laugerie Basse, ½.

of a dagger (Fig. 87) of reindeer antler has been carved into the shape of that animal, with his head thrown back, so as to allow the antlers to rest on the shoulders, the forelegs being folded gracefully under the body, and the hind passing gradually into the blade. An examination of the figure shows with what grace the artist has treated the animal. The same composition is to be observed in the figure of a reindeer carved in ivory, from the rock-shelter of Montastruc,[2] not far from the cave of Bruniquel, in which place the figure of an elephant

[1] Darwin, *Variation under Domestication*, and *Descent of Man*.

[2] Peccadeau de l'Isle, *Revue Archéol.* 1868, p. 213. *Matériaux*, 1868, p. 96. Hamy, *Paléontologie Humaine*, p. 331.

has also been discovered. In both of these the body forms the handle of the dagger. The human figure also is represented in two small ivory statuettes[1] found in the caves of Southern France ; but, as might be expected, they are so roughly done, that they tell us little of the physique of the Cave-man. The ivory used in the sculptures and engravings was undoubtedly derived from the tusks of the mammoth, and the sharpness of the outlines implies that it was used while fresh. The graving tools consisted of the sharp edges and points of flint flakes.

When we take into account the rude materials which the Cave-men possessed for their sculptures and engravings, the accuracy with which they represented the figures which came more prominently before them in their daily life is most extraordinary, and at the present day it only finds a parallel among uncivilised peoples in the artistic representations of the Eskimos.

Skeletons of Cave-men.

Human bones of the Cave-men are as rare in the caverns and rock-shelters as in the river-deposits, and are for the most part represented merely by fragments. We owe to M. Dupont[2] the discovery of a lower jaw and an ulna at a depth of 4·50 mètres below the surface, in the cave of Naulette, in an undisturbed layer, covered by successive deposits of sand, stalagmite, and clay. The jaw is massive and prognathous. A second case of the occurrence of the bones of Cave-men is offered by a lower jaw obtained by M. de Vibraye in the Grotte des Fées,[3] at Arcy-sur-Cure (Yonne). It rested in the

[1] Laugerie Basse, *Matériaux*, 1868, p. 209. [2] *Op. cit.*

[3] *Bull. Soc. Geol. de France*, 2d sér. xvii. p. 462. Hamy, *Paléontologie Humaine*, 1870, p. 235.

middle of a stratum at a mètre from the surface, along with flint implements and a sacrum of a cave-bear, deeply cut, and the remains of the spotted hyæna, mammoth, and woolly rhinoceros. It presents the same characters, but in a less marked degree, as that of Naulette.

Human skeletons, probably of the age of the Cave-men, have been discovered by M. Massenat in the refuse-heaps under the rock-shelter of Laugerie Basse.[1] One of these, termed "the crushed man," lay at a depth 4 mètres in the *débris* of ancient hearths, and underneath large blocks of stone which had fallen from the rock above. It was in the crouching posture, and had apparently been crushed by the rocks above. According to Dr. Hamy it belongs to the same long-headed, robust race of men, whose remains are met with in the rock-shelter of Cro-Magnon. Other human remains, previously obtained from the same place by M. Massenat, possess long skulls of the usual Neolithic type, as well as the flattened tibia and other modifications of bones of the thigh and leg, which, in Professor Busk's opinion, show that the feet were not hampered in their movements by a rigid sole or sandal.[2]

A human frontal and lower jaw from La Madelaine, together with flattened (platycnemic) tibiæ, are also recorded by Professor Edward Lartet, and are referred by Dr. Hamy to the age of the Cave-men.

A human tooth, found in the cave of Plas Newydd, already referred to, is the only piece of the human frame of late Pleistocene age found in Great Britain.

[1] *Rel. Aq.*, p. 256.

[2] *Cave-hunting*, c. v.

Human Remains in the Cave of Duruthy.

One of the best examples of the discovery of human bones, of the Cave-men, is offered by the cave of Duruthy, explored by MM. L. Lartet and Chaplain-Duparc, in 1874,[1] which is of very high importance also in other respects. The cave is situated on a rocky promontory of nummulitic limestone, near Sorde, in the Western Pyrenees, overlooking the junction of the Gave d'Oleron and Gave de Pau, two tributaries of the Adour, and is hollowed in the nummulitic limestone. The undis-

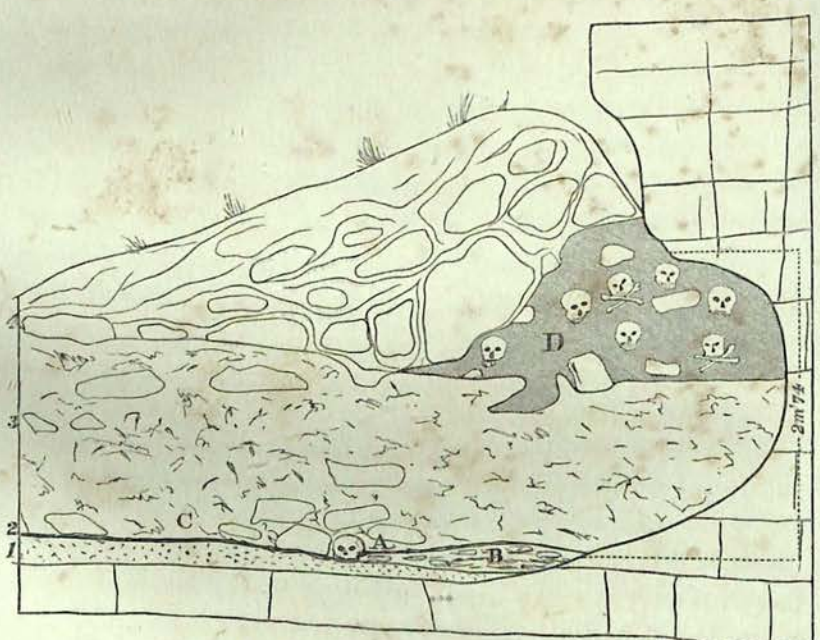


FIG. 88.—Section of Duruthy Cave.

turbed strata which it contained were in the following order (Fig. 88) :—On the rocky floor was a layer of red

[1] *Matériaux*, 1874, p. 101 *et seq.* *Bull. Anthrop. Soc. de Paris*, ix. p. 516 *et seq.*

earth with flint flakes and fragments of charcoal (1), in the upper part of which was a thin layer of soil, black with charcoal (2), replaced on the inner side by a yellow loam, in which no less than forty canine teeth of bear, and three canine teeth of lion, perforated for suspension, were found lying side by side, in such a manner as to prove that they had formed part of a necklace (B). On this layer rested a crushed human skull (A of figure). Then succeeded a thick accumulation of refuse (3), composed of broken bones of horses, oxen, stag, and reindeer, large quantities of ashes, and various flint implements, scrapers, flakes, and the like, of the usual Palæolithic types, as well as a few scattered human phalanges. This in its turn was covered by a thick talus (4), which had fallen from the cliff above, and completely masked the rock-shelter. In it the large blocks of stone fallen from the cliff, and which were to be observed also in No. 3, had evidently been arranged on the inner side so as to form a barrier, and on the removal of this a sepulchral vault (D) was exposed to view, containing numerous skulls and skeletons, proved to be of Neolithic age by beautifully chipped implements, one of which bore marks of grinding. There were also rude fragments of pottery, and various implements of bone of the usual Neolithic type. The bodies also had been buried in the crouching posture so universal in interments of that age, and the entrance had been blocked up with large slabs of stone obtained from the neighbouring cliff. The talus had accumulated during the long series of ages separating the Neolithic age from the time of the discovery. The strata below were undisturbed, and the Palæolithic age of the human skull at A was established by its position, as well as by its association with the implements of that period.

MM. Lartet and Chaplain-Duparc consider that the necklace belonged to the possessor of the skull (A), who may have been killed by the fall of the blocks of stone found above it; and they account for the absence of the rest of the skeleton by the suggestion that the body was devoured by wild beasts. The necklace is a remarkable trophy of the chase, for besides proving that the Cave-men were in the habit of killing lions and bears, the engravings with which most of the teeth are adorned are of singular interest. Most of them are marked with deep artificial grooves and with the barbed heads of harpoons or arrows, similar to those we have figured, and one of which was found near the skull at the point C. On one bear's tooth a pair of gloves has been engraved, on another is to be seen the figure of a pike standing out in relief; while on a third the figure of a seal has been engraved in outline with its characteristic head and flippers admirably drawn (see Figs. 75, 76, 82, 84). It is, therefore, evident that the hunter of the Western Pyrenees depended not merely upon the animals haunting the forests and the plains for food, but that he descended from time to time to the shore, and waged war against creatures living in the sea, after the manner of the modern Eskimos.

The human skull is referred by its discoverers, and Dr. Hamy,[1] to the same race of men as those found in the cave of Cro-Magnon. Its crushed condition, however, and the absence of the facial bones, render this view doubtful, although enough of it is preserved to show that it was long. The skulls from the Neolithic tomb above are also long, and are considered by their discoverers to belong to the same race as those of Cro-

[1] *Bull. Anthrop. Soc. de Paris*, ix. (1874), p. 527 *et seq.*

Magnon and the other caves of the Vezère. They therefore hold that in this cave there is proof of the survival of the Palæolithic man of the caves into Neolithic times. It seems to me that the evidence ought to be read the other way, and that it tends to show that the "race of Cro-Magnon," which I have already given my reasons for believing to be later than the Palæolithic, really belongs to the Neolithic age (see pp. 206-7).

No Interments proved to be of Palæolithic Age.

The fact that caves were largely used as sepulchres in the Neolithic age renders it necessary to use extreme caution in assigning any interments to the Palæolithic dwellers in caves without unmistakable evidence. This seems to me to be wanting in most of the examples generally accepted, which I have classified under the head of doubtful in my work on *Cave-Hunting*. For the reasons there given the antiquity of the Neanderthal skull is doubtful, while the interments in Cro-Magnon are seen in the section (Fig. 74) to be later than the Palæolithic accumulation below. The so-called "fossil man of Mentone" may be referred to the same date as the polished stone axe of the Neolithic age found in the cave, and now preserved in the museum at St. Germain. The pottery found in the caves of Engis and Trou de Frontal in Belgium, and in those of Aurignac, Bruniquel, and Bize, is identical with the Neolithic pottery, and may therefore be taken to indicate the date of the interments.

Those experienced in digging caves know how very difficult it is to separate the contents of deposits of two different ages lying together in the same place, and fre-

quently mingled together by previous diggers, as well as by the burrowing animals. There seems to me no case on record up to the present time which establishes the fact that the Cave-men were in the habit of burying their dead so securely as to keep out the hyænas. The fragmentary remains of the human frame left in the refuse-heaps may reasonably be taken to imply that disregard for the bodies of the dead which is so conspicuous among the modern Eskimos.

Relation of the Cave-men to the River-drift men.

In the course of this chapter we have seen that the river-drift implements in the caves of Cresswell Crags, of Kent's Hole, and of the Grotte de l'Eglise, are found in the strata below those with the implements of the Cave-men, and consequently that the River-drift men lived in Britain and France before the Cave-men. We have also noted that the latter are in a different stage of culture from that which was enjoyed by the former, the implements being not only better, but, taken as a group, of a different kind, although some simple forms, such as the flake, scraper, and hammer-stone, are common to both. How are they related to each other? Is the culture of the latter the outcome of the development of that of the former? Or is it to be viewed as having been introduced into Europe by a totally different race? In dealing with these difficult questions several important considerations must be weighed. First, the absence of the higher types of implement in the camping-places of the River-drift men cannot be accounted for on the ground that they are smaller, or that they are partly composed of bone and antler, which are more perishable

than the massive flints of the river-drift deposits. Camping-places of the Cave-men have been met with in France and in Germany, in which the implements are associated together in the same manner as in the caves. From one of these, at Schussenried in Würtemberg, Professor Fraas has described implements of bone and antler in an old refuse-heap resting upon a glacial deposit, formed by an extension of the Alpine glaciers into the valley of the Rhine, and proving that the Cave-men hunted the reindeer in Würtemberg after the retreat of the ice from that district. A second example is offered by that of Solutré, mentioned above, where implements of bone and antler, and elegantly chipped flint implements, some very small, have been met with by MM. Ferry, Arcelin, and others. Some caves and rock-shelters also were inhabited by the River-drift men, who have left behind their implements without any trace of the higher types of the Cave-men, although the refuse-heaps of both have been subjected in the main to the same set of destructive agencies. In them the two series present the same contrast in contents as that offered by the implements from the River-drift when compared with those of the caves. The two series must therefore be taken to represent two distinct states of culture, of which the newest, or that of the Cave-men, is by far the higher.

Mr. Evans[1] is inclined to hold that they belong to the same age and the same race, his argument being principally based upon the fact that the associated animals are the same in the river-deposits and the caves. It must, however, be remarked that the Pleistocene age was of vast duration, and that the latest division of it, during which the animals exhibit no variation, was long

[1] *Ancient Stone Implements*, p. 574.

enough to allow of a series of migrations of man, or of the development of a new culture in Europe. Its length may be estimated from the fact that although the rivers of Great Britain have not materially altered their courses or lowered their valleys since the invasion of the Romans, the rivers in the late Pleistocene age present both these changes. The river Wily near Salisbury, for example, quoted above, cut its way down upwards of 80 feet, and developed a new course for itself, while the River-drift men and late Pleistocene animals were living in the district. These changes, measured at the present rate of erosion, could not have been produced in a short time,[1] and when they are recognised as part of a similar series of changes affecting the hills and valleys of the whole of Europe they imply a vast series of ages. Further, although the fauna of Europe has remained almost the same from the close of the Pleistocene age down to the present time, man and his influence being put out of the question, various races of men in different stages of culture have successively invaded Europe. It may be concluded therefore that the identity of the fauna of the caverns with that of the river-deposits can reveal nothing as to the relation of the Cave-men to the River-drift men.

A strong argument in favour of their belonging to two different races may be founded on their different range. The River-drift hunter wandered over the whole of Europe south of Norfolk, leaving traces behind in Spain, Italy, and Greece, and through Asia Minor and the whole of India. The Cave-man is restricted to the area extending from the Alps and Pyrenees as far north as Derbyshire and Belgium, and has not been as yet found farther east than Poland and Styria. Had they belonged

[1] On this point see Evans, *Ancient Stone Implements*, c. XXXV.

to the same age and race this difference could hardly have occurred. This difference in range implies, as we have already observed, that the River-drift men belong to the southern group of Mammalia, while the Cave-men must be classified with the reindeer, the musk sheep, and other northern animals. After taking these facts into account, they may be referred either to two distinct races, or to two sections of the same race which found their way into Europe at widely different times; the River-drift men being of far higher antiquity in Europe, and probably having lived for countless generations before the arrival of the Cave-men and the appearance of the higher culture.

We are without a clue to the ethnology of the River-drift man, who most probably is as completely extinct at the present time as the woolly rhinoceros or the cave-bear; but the discoveries of the last twenty years have tended to confirm the identification of the Cave-man with the Eskimos.

Relation to the Eskimos.

On passing under review the manners and customs of all the savage tribes known to modern ethnology, there is only one people[1] with whom the Cave-men are intimately connected, in their manners and customs, in their art, and in their implements and weapons. The Eskimos range at the present time from Greenland on the east, along the shores of the Arctic Sea, as far to the west as the Straits of Behring,[2] inhabiting a narrow littoral strip of country, and living by hunting, fishing,

[1] This question is discussed also in Chapter IX. of my work on *Cave-hunting*.

[2] It appears also from the letters recently sent home by Professor Nordenskiold that they inhabit the shores of North-Eastern Siberia.

and fowling. They collect round their habitations vast refuse-heaps, of precisely the same kind as those of the Cave-men in Europe. Captain Lyon gives the following account of one of these which he visited in the summer at Igloolik :—[1]

"The ground all around was strewed with skulls and skeletons of animals; and human heads were picked up to the amount of at least a dozen! Bones indeed were so numerous that we literally trod on them. A large stagnant field of mud surrounded the place, adding its full share of sweets, as it was constantly ploughed up by all who walked through it to the huts: the bottom of this also felt as if covered with bones. Near at hand were several large tumuli, which had formerly been dwellings, but which were now solid moss-covered mounds. From their appearance in decidedly different states of antiquity, from the very slow progress either of vegetation or decay in a country which for at least nine months in the year is frozen as hard as a rock, and from the natives never recollecting them as being inhabited, I am led to suppose that the island of Igloolik must have been, for centuries, the residence of Eskimaux. It is strange that the skulls of men should have been left to lie neglected under foot amongst those of all kinds of animals; but the natives treated the matter with the utmost indifference, and a lad who accompanied me a few miles inland to shoot, carried down to the boat for me a couple of human heads I had found near a lake, with the same willingness as some ducks I had killed. In the course of my rambles I saw four more of these remnants of Eskimaux, which were eagerly pointed out by the boy when he saw I was interested in them.

[1] Lyon's *Private Journal*, p. 236.

Near one a stone cooking-vessel was lying, and had probably been buried at the same time as the body.

"In addition to the above specimens, I was so fortunate, after a long chase, as to shoot a snowy owl, an extremely rare and beautiful bird, and seldom seen even in these regions."

Time and place being changed, this account would stand, in its main outlines, for a description of one of the refuse-heaps on the banks of the Vezère, or of the tributaries of the Humber, or in the valleys of the Lesse, of the Meuse, or the Adour. The bones are broken in the same way, and belong to a large extent to the same animals. In both are the remains of the reindeer, musk sheep, Arctic fox, Arctic hare, grouse, and snowy owls, as well as traces of whales and seals. The differences are merely those resulting from the fact that the Eskimos live, to a very great extent, upon marine animals, while the Cave-men were surrounded by the rich and varied fauna inhabiting Europe in the late Pleistocene age.

The rarity of human bones in the refuse-heaps of the Cave-men is satisfactorily explained by the abundance of the hyænas, which would inevitably eat up any human body left insufficiently protected. The few cases in which fragments of the human skeleton have been found in the refuse-heaps of the Cave-men, coupled with the absence of any well-authenticated case of an interment, renders it very probable that they cared as little for their dead as the Eskimos, who leave them covered up with a few slabs of snow, to be eaten up by their dogs and foxes, with the greatest indifference. Captain Parry was informed by a friend of a deceased Eskimo at Igloolik, that when he left the huts "with his wife, a

dog was devouring the body as he passed," and, in a second and worse case, of the body being attacked by dogs, the friends did not hesitate to laugh as they heard or told the story.[1] This total want of reverence for the dead is exhibited, so far as I know, by no other people of the present time, and it is therefore not a little remarkable to find the traces of a similar insensibility among the Cave-men.

An appeal to the implements and weapons proves that the manner of life of the Cave-men was the same as that of the Eskimos. The scrapers made of stone for the preparation of skins are of exactly the same pattern in both (Fig. 89). The original of the above figure has its handle made of mammoth ivory, with which the Eskimos are very well acquainted, and which they use for making various articles, as we have seen the Cave-men employed it, who hunted the animal in Auvergne. It is very possible that this habit of the Eskimos may have been handed down from the late Pleistocene times. Their supply is obtained from the fossil tusks preserved from decay by the intense cold of the Arctic regions. The sewing-needles also are of the same pattern in both, and, as Professor Ed. Lartet has pointed out, the same tendons in the reindeer's feet were used for thread for sewing skins together among

FIG. 89.
Eskimo Scraper.

[1] *Second Voyage*, 4to, pp. 393, 396.

the dwellers within the Arctic circle and the inhabitants of the European caves. The stone spear and arrow heads are the same in both. The barbed fowling and fishing spears also have their heads attached to the shafts in the same manner among both peoples, and are of the same form, as may be seen by a comparison of Fig. 90 with Figs. 65, 66. The only difference to be observed is that they are free from the deep grooves which characterise most of those from the late Pleistocene caverns. Some, however, of the latter are without this ornament. The same identity of forms runs through their bundles of charms or amulets, composed of perforated and variously cut teeth, bones, and antlers, the marrow spoons, and the daggers of reindeer antler.

FIG. 90.
Eskimo Spear.

Certain implements found in the refuse-heaps of Belgium, France, and Switzerland, and the caverns, formed of reindeer antler, and perforated by one or more holes, and very generally ornamented, are known under the somewhat fanciful name of "bâtons de commandement." If those with one hole (Fig. 91) be compared with with the peculiar instrument used by the Eskimos for straightening arrows (Fig. 92), it will be seen that they are of the same type, and probably intended for the same purpose. The hole in those from the caverns is generally round, while that in those of the Eskimos is generally square; it is, however, round in one of the specimens in the British Museum. It must

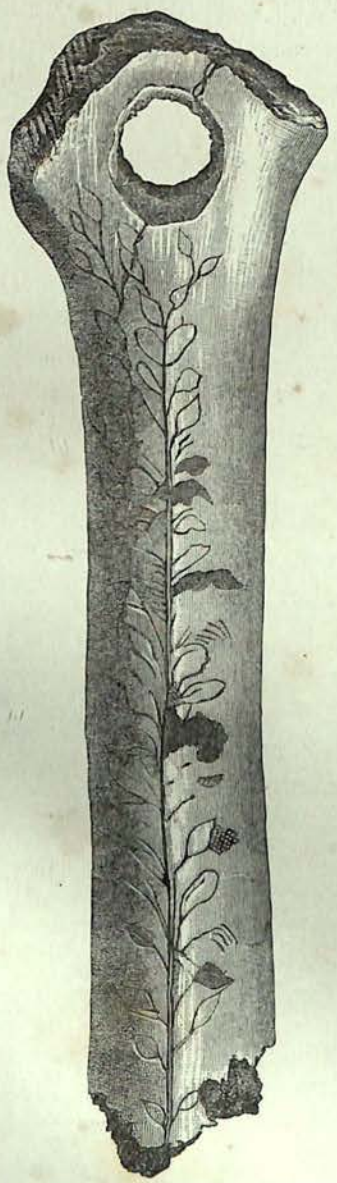


FIG. 91.—Implement from Veyrier, ½.

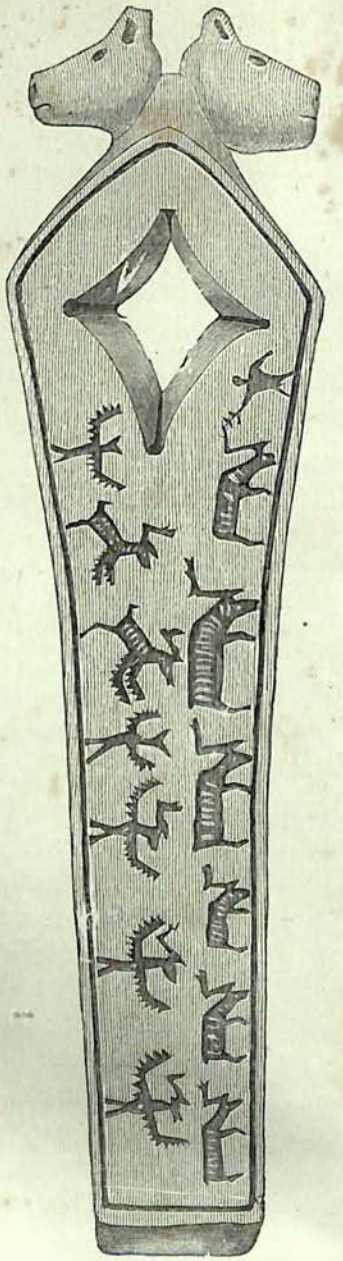


FIG. 92.—Eskimo Arrow-straightener of Walrus-tooth, ½.

also be remarked that all those found in the caverns are considerably the worse for wear. The gloves, also, of the Cave-men (Fig. 75) are similar to those now used by the Eskimos.[1]

The most astonishing bond of union between the Cave-men and the Eskimos is the art of representing animals. Just as the former engraved bisons, horses, mammoths, and other creatures familiar to them, so do the latter represent the animals upon which they depend for food. On the implements of the one you see the hunting of the urus and the horse, depicted in the same

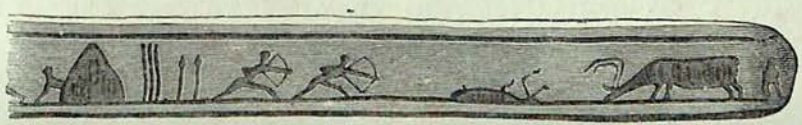


FIG. 93.—Eskimo Hunting Scene.

way as the killing of the reindeer or walrus on the implements of the other (Fig. 93). Reindeer and seals are represented in the same manner by both. The identity of the style is so extraordinary, that had the

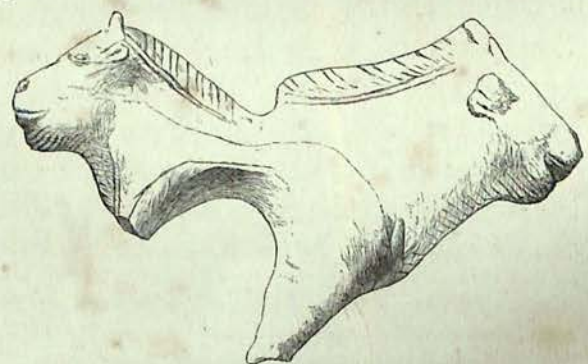


FIG. 94.—Portion of Implement, Laugerie Haute, ½.

head of the arrow-straightener (Fig. 94) from Laugerie

[1] The gloves of the Eskimos in the British Museum present consider-

Basse been found in a museum without a history, it would be ascribed to the same people as those who engraved the arrow-straightener (Fig. 92).

The probable identity of the Cave-men with the Eskimos is considerably strengthened by a consideration of some of the animals found in the caves. The reindeer and the musk sheep, the marmots, the Arctic foxes, the grouse, and snowy owls, which afforded food to the Cave-men, are still used for food by the Eskimos; and the group of animals hunted by the former in Europe is represented by fossil remains found throughout the vast region which divides the Cave-man of the Upper Danube from the inhabitant of West Georgia.

Numerous fossil bones have long been known to occur in the frozen morasses, as well as in the river-deposits in the caverns, in Central and Southern Russia in Europe, as well as throughout Siberia. In the list of animals described by Dr. Brandt,[1] discovered in the caverns of the Altai Mountains, we may remark the cave-hyæna, brown bear, pouched marmot, beaver, alpine hare, elk, stag, roe, bison, horse, and wild boar, as well as the three extinct species, the Irish elk, the woolly rhinoceros, and the mammoth. We do not lose sight of this group of animals until we cross the Straits of Behring into the land of the Eskimos. The remains obtained by Captains Beechey and Kellett[2] in the frozen gravels composing the cliffs of Eschscholtz Bay

able variations. Those from Victoria Land have a thumb and four fingers, or a thumb only, those from Disco and Cambridge Bay a thumb only, while those from Point Barrow have a thumb and three fingers.

[1] Brandt, *Mélanges Biologiques tirés du Bull. Acad. Imp. des Sc. de St. Pétersb.*, t. vii. 1870.

[2] Beechey, *Voyage to the Pacific*, 4to, 1831, appendix; Kellett, *Zoology of H.M.S. Herald*, 4to, 1854.

belong not merely to animals now living in America, such as the elk, reindeer, and the bison, but also to the mammoth and the horse. The western portion of arctic America at this time belonged to the same zoological province as northern and central Europe and Asia, and was not then isolated from those regions by a tract of sea. We may therefore conclude that the man who hunted the mammalia living in Europe at this time is likely to have hunted them also in Asia and in America. Nor is the probability of his identification with the Eskimos of the present day weakened by the great distance which separates the Palæolithic caverns of Europe from the arctic regions of North America. The musk sheep, now only found in the country of the Eskimos, has been traced by its fossil remains through Russia into Germany, and as far to the south-west as the Pyrenees. Its survival in North America is to me a parallel fact to the probable survival of the Cave-men as the modern Eskimos of the same region.

All these points of connection between the Cave-men and the Eskimos can, in my opinion, be explained only on the hypothesis that they belong to the same race. To the objection that savage tribes, living under the same conditions, might independently invent the same implements, and that, therefore, the correspondence in question does not necessarily imply a unity of race, the answer may be made, that there are no savage tribes known which use the same *set* of implements without being connected by blood. The ruder and more common instruments, such as flakes, and in a lesser degree scrapers, are of little value in classification, but where a whole *set* agrees, intended for various uses, and some of them rising above the most common wants of savage life, the argu-

ment as to race is of considerable weight. It is still further strengthened by the identity of art. The articles found in the caves of Britain, Belgium, France, or Switzerland differ scarcely more from those used in West Georgia than the latter from those of Greenland or Melville Peninsula.

From these considerations it may be gathered that the Eskimos are probably the representatives of the Cave-men, and protected within the Arctic Circle from those causes by which they have been driven from Europe and Asia. They stand at the present day wholly apart from all other living races, and are cut off from all both by the philologer and the craniologist. Unaccustomed to war themselves, they were probably driven from Europe and Asia by other tribes in the same manner as within the last century they have been driven farther north by the attacks of the Red Indian.

The Cave-men not represented among the present Populations of Europe.

What is the relation of the Cave-men to the peoples who succeeded them in Europe? Did they disappear at the close of the Pleistocene age without leaving any traces behind, or were they absorbed into other races invading Europe in the Neolithic age? The answer to these questions will depend upon the view which we take of the age of the human skeletons in the caves of Cro-Magnon, Frontal, Furfooz, and Mentone. If we follow those lately published in the *Crania Ethnica*, and the *Matériaux* by MM. Quatrefages, Hamy, and Louis Lartet,[1]

[1] Quatrefages and Hamy, *Crania Ethnica*, i. ii. iii.; *Matériaux*, 1874 p. 167, 1875 p. 58; Louis Lartet, *Matériaux*, 1874, p. 167.

we shall identify the Cave-men not only with the long-headed and round-headed races of men of Neolithic Europe, but with men now living in France and Belgium. The evidence, however, seems to me insufficient to establish the Palæolithic age of any one of the skeletons in the above caves,[1] while the fragmentary condition of all the human remains which are Palæolithic forbids any speculation as to the race to which they belonged.

If we appeal to the arts of the Cave-men, and those of their Neolithic successors in Europe, to be examined in the next chapter, it will be seen that there is absolutely no connection between them. The former had an extraordinary facility in reproducing animal forms on their implements and ornaments; the later had no idea of representing animals. The whole set of implements and weapons also, excepting such elementary forms as the flint flake, the pointed bone, and antler, and the needle, are altogether different. The hard-and-fast line of demarcation between the two in every country where their remains have been discovered would be impossible had the Palæolithic race or races been absorbed by Neolithic invaders. How, then, can we account for their disappearance? Simply by assuming that at the close of the Pleistocene age, when they came into contact with Neolithic invaders, there were the same feelings between them as existed in Hearne's times between the Eskimos and the Red Indian, terror and defenceless hatred being, on the one side, met by ruthless extermination on the other. In this way the Cave-men would be gradually driven from Europe, without leaving any mark on the succeeding peoples either in blood or in manners and customs.

[1] My reasons for this view are given in *Cave-hunting*, c. vii.

General Conclusions.

The reader will have gathered from this and the two preceding chapters an idea of the extraordinary conditions under which man lived in Europe in the Pleistocene age. There is no trace of the knowledge of pottery or of spinning, nor at this time were domestic animals or cultivated seeds or fruits known in our quarter of the world. The Palæolithic tribes led a wandering feral life under feral conditions, and had not learned the arts of moulding plants and animals to their various needs, and thus freeing themselves to some extent from bondage to their natural conditions. The reader has seen, further, that man appears in two phases of the hunter stage of human progress—the older and lower, or that of the River-drift, and the newer and higher, or that of the Cave-men. The River-drift man was a hunter of a very low order, but not lower than the modern Australian, and from his wide range over the Old World was probably of vastly greater antiquity than his successors in Europe. There is no reason for the belief that he possessed any artistic skill. The Cave-man, on the other hand, possessed a singular talent for representing the animals he hunted, and his sketches reveal to us that he had a capacity for seeing the beauty and grace of natural form not much inferior to that which is the result of long-continued civilisation in ourselves, and very much higher than that of his successors in Europe in the Neolithic age. The hunter who was both artist and sculptor, who reproduced with his imperfect means at one time foliage (Fig. 91), and at another the quiet repose of a reindeer feeding (Fig. 86), has left behind the proof of a decided advance

in culture, such as might be expected to result from the long continuance of man on the earth in the hunter stage of civilisation. From the evidence brought forward in this chapter, there is reason to believe that he is represented at the present time by the Eskimos.

CHAPTER VIII.

THE ARRIVAL OF THE PREHISTORIC FARMER, AND THE HERDSMEN—THE NEOLITHIC CIVILISATION.

Definition of the Prehistoric Period. — Geography of Britain. — Submerged Forests.—Climate of Britain.—Prehistoric Mammalia.—Wild Species.—Prehistoric and Historic Periods belong to the Tertiary. —Difference between Late Pleistocene and Prehistoric Mammalia.— Magnitude of Interval between Pleistocene and Prehistoric Periods.— Relative Length of Pleistocene and Prehistoric Periods.—Neolithic Civilisation of Britain and Ireland.—Habitations.—Hut Circles and Log Huts.—The Neolithic Homestead.—Implements.—Spinning and Weaving.—Pottery.—The Flint Mines near Brandon.—The Implement Manufactory at Cissbury.—Commerce.—Navigation.—Warfare and Camps.—Britain occupied by Tribal Communities.—Burial of Dead.— —Belief in a Future State.—General Conclusions as to Neolithic Culture in Britain.—Neolithic Civilisation on the Continent.—The Pile-dwellings of Switzerland.—The Domestic Animals and Cultivated Plants.—The Shell-mounds of Denmark.—The Neolithic Art. —The Neolithic Civilisation derived from Central Asia.—General Conclusions.

We have now arrived at the point in the inquiry into the condition of early man which is marked by the dawn of agriculture, by the arrival of domestic animals, and the invention of many useful arts; at that fountain-head whence the civilisation of Europe, such as we know it now, was derived. From this time forward to the borders of history we have to record the advance of man in cul-

ture, and his passage from the condition of the farmer and herdsman to that of the merchant and manufacturer. Instead of the wanderer dependent on the chase, we have to deal with the dweller in fixed habitations, and with those social conditions which follow from men being massed together in various centres for the common good. We have to chronicle in the Prehistoric period the changes wrought in Europe by the invasion of new peoples, and the appearance of new civilisations—changes similar to those which are now rapidly causing the hunters of the bison in the far west to disappear before the advance of the English colonist.

Definition of the Prehistoric Period.

The Prehistoric period covers all the events which took place between the Pleistocene age on the one hand and the beginning of history on the other. To it belong most of the alluvia and the peat-bogs, as well as the contents of certain caverns characterised by the presence of the wild mammalia now living in Europe, and of the wild or half-wild animals which had escaped from their servitude to man. One species only of all the mammals then alive, the Irish elk, has since become extinct. Man appears in the Neolithic stage of culture, or that of polished stone, along with the stocks of the more important of the domestic animals, and many of the cultivated seeds and fruits. Subsequently in the long course of ages bronze became known, and then iron, each causing a great change in the arts and the social condition of the people.[1] Polished stone, bronze, and iron, it must

[1] For further details as to this classification, see Evans, *Ancient Stone Implements*, c. i.; and Lubbock, *Prehistoric Times*, c. i.

be remarked, are merely the outer signs or symbols of three phases of culture, each of which was higher and better than that which went before. The history of Britain begins late in the Iron age.

The Prehistoric period is separated from the Pleistocene by a long interval, during which, not merely great changes in the zoology of Britain took place, but also corresponding changes in the geography.

Geography of Britain in the Prehistoric Age.

At the close of the Pleistocene age (Fig. 32), the valleys which united Britain to North France, Germany, and Scandinavia, as well as to Ireland, were gradually depressed beneath the sea-level; and the North Sea, the British Channel, the Irish Sea, and the Western Atlantic coast-line generally became very much as we find them now (see Fig. 95). An examination, however, of the submerged forests and peat-bogs proves that the downward movement had not ceased until a late period in the Neolithic age.

Submerged Forests.

We can approach this interesting question most conveniently by examining the evidence as to the submarine forest exposed between tide-marks on the coast of west Somerset, admirably described by Sir Henry de la Beche and by Mr. Godwin-Austen.[1]

It was shown by the latter to be rooted on "an

[1] *Geological Report on Cornwall, Devon, and West Somerset.—Quart. Journ. Geol. Soc. Lond.* 1865.

angular detritus," and to be covered by deposits in the following order:—

1. A blue freshwater-mud deposit, resulting probably from the depression of the land.
2. A surface of plant growth (Iris).
3. A marine silt with *Scrobicularia piperata*.
4. Shingle that forms a ridge, which is at the present time encroaching on the level water meadows behind.

The physical changes in the district implied by this section are considered by Mr. Godwin-Austen to be as follows:—The angular detritus in which the trees are rooted was an old surface soil, formed at a time when the climate was more severe than it is at present, and probably while the boulder clays north of the lower valley of the Severn were falling from melting icebergs. This was followed by the epoch of the growth of the forest and of the accumulation of vegetable matter. The overlying blue clay (No. 1) marks the time during which the trees were killed; the surface of marsh-growth (No. 2) covered with iris marks the epoch when the trees fell; the silt (No. 3) indicates a depression below the sea-level; and, lastly, the silt was elevated, and the shingle (No. 4) thrown up on its surface, to form the barrier at high-water mark.

Mr. Godwin-Austen's valuable essay recalled to mind a worked flint which I had found in the angular detritus in 1861, and the Rev. H. H. Winwood and myself resolved to re-examine the forest-bed and the associated deposits.

On digging through the layer of undisturbed vegetable matter, we met with ample traces of man's handiwork in flint and chert chippings, as well as a well-formed

flake which apparently had never been used. They were imbedded in the upper ferruginous portion of the angular detritus, and evidently had been dropped upon the surface-soil of the period, and not transported by water. On searching the shingle we found only one water-worn flint-pebble, which possibly may have been washed out of the angular detritus. It is therefore probable that the presence of flint and chert in that neighbourhood is due to their transport by man.

Encouraged by these results, we resolved to explore the submarine forest in the nearest bay to the east, close to Minehead. It there consists of oak, ash, alder, and hazel, which grow on a blue clay, full of rootlets that thicken considerably seawards. The blue clay in its lower part is full of angular fragments of Devonian rocks, which, as at Porlock, constitute a land-wash, and not a shingle. At the point between tides, where the angular fragments began to appear, splinters were found which had been struck off by the hand of man in the manufacture of implements. They were imbedded in a ferruginous band as at Porlock, and occurred as deep as one foot from the surface of the bed. We dug in several other spots without finding any other traces of man.

In both these localities it is clear that man had been living on the old land-surface before it was submerged, and that the remains of his handiwork had been dropped in the angular detritus which Mr. Godwin-Austen believes to be subaërial and glacial.

From these facts we may infer that man was living in this region during the time that a dense forest overshadowed a large portion of what is now the Bristol Channel, and before the deposit of the blue freshwater

clay and the marine silt, at a time not later than that marked by the layer of peat or vegetable soil in which the prostrate trees are imbedded.

These submerged forests are mere scraps, spared by the waves, of an ancient growth of oak, ash, and yew, extending in Somersetshire underneath the peat and alluvium, and joining the great morasses of Glastonbury, Sedgemoor, and Athelney; in which Neolithic implements have been met with by Mr. Stradling. The discovery of flint-flakes and an old refuse-heap with mammalian remains by Mr. Ellis,[1] in the submerged forest of Barnstaple, affords the same kind of evidence that man was living in Devonshire while the land stood considerably higher than it does at the present time. The bones of Celtic short-horn (*Bos longifrons*), stag, sheep, and goat, had evidently been accumulated around the piles before they were in their present position between high and low water mark, since such an accumulation would have been impossible in a spot between tides. In all probability the piles were driven into a peaty morass on the land surface.

Conclusive proof of submergence within comparatively modern times is brought forward by Mr. Pengelly in his paper "On the Submerged Forest of Torbay." The forest consists of a layer of peat, sometimes ten feet thick, which sweeps upwards from low-water mark to the higher grounds, the subaërial portion being covered with three feet of loam. From it have been obtained the stag, hog, horse, and Celtic short-horn, and antlers of stag cut by man. Here, therefore, as well as in North Devon and Somersetshire, man was in possession of the

[1] *Int. Congress Prehist. Archæol.* November vol. p. 89. See also Mr. Townshend Hall, *Quart. Journal Geol. Soc. Lond.*, June 1879.

country when the land stretched farther out to sea than at the present time. In this particular case Mr. Pengelly estimates the submergence to have been not less than forty feet since the forest was alive.

Similar proofs of submergence are to be met with on our coasts wherever the land dips gently under the water line. On the shores of St. Bride's Bay, in the twelfth century, the stumps of trees, and the peat around them at low water, excited the wonder of Gerald de Barri,[1] and yielded to Dr. Hicks, in 1868, the remains of the brown bear and the stag. From this point the forest has been observed in very many places farther north, at Liverpool, and on the coast of Lancashire. In the latter district it has been shown by Mr. De Rance to be older than the Roman occupation, since Roman coins were discovered in the tidal alluvium,

[1] "From Haverford we proceeded on our journey to Menevia, distant from thence about 12 miles, and passed through Camros, where, in the reign of K. Stephen, the relatives and friends of a distinguished young man, Geraldus, son of William, revenged his death by a too severe retaliation on the men of Ros. We then passed over Niwegal sands, at which place, during the winter that K. Henry the Second spent in Ireland (as well as in almost all the other western ports), a very remarkable circumstance occurred. The sandy shores of South Wales being laid bare by the extraordinary violence of a storm, the surface of the earth which had been covered for many ages reappeared, and discovered the trunks of trees cut off, standing in the sea itself, the strokes of the hatchet appearing as if only made yesterday; the soil was very black and the wood like ebony; by a wonderful revolution the road for ships became impassable, and looked not like a shore but like a grove cut down perhaps at the time of the deluge, or not long after, but certainly in very remote times, being by degrees consumed and swallowed up by the violence and encroachments of the sea. During the same tempest many sea-fish were driven by the violence of the wind and waves upon dry land. We were well lodged at S. Davids by Peter, Bishop of the See, a liberal man, who had hitherto accompanied us during the whole of our journey."—*Itinerarium Cambriæ.* Book i. cap. 13.

which covers it near the mouth of the river Alt, at High Town. The depth to which the forest has been submerged in this district cannot be less than thirty feet. It is worthy of remark that the enormous trunks of the trees prove that the Scotch firs, oaks, yews, willows, and birches, of which the forest was in these places mainly composed, must have grown at some distance from the ancient coast-line, since the westerly winds sweeping over Lancashire from the Atlantic at the present time prevent the free growth of vegetation on every unprotected spot on the coast. The prevalent gales, however, are proved to have been very much the same as now, by the position of the trees, which lie prostrate with their heads pointing towards the east.

Evidence similar to this is to be found in the forest growths on the coasts, extending underneath the alluvium at the mouths of our rivers, as for example that of the Thames, which shows that the submergence has not been local, and that the depression of land throughout Great Britain and Ireland, since the trees flourished, could not be less than from thirty to forty feet. The ten-fathom line, therefore, considered by Sir Henry de la Beche to be roughly the boundary of the land at that time, may be taken to represent the sea margin with tolerable accuracy. In that case a considerable area would be added to the land surface of Britain, and especially of Cardigan Bay, of which the Welsh peasant still tells the story of the land swallowed by the sea; and off the coast of Lancashire and Cheshire, where the size of the submerged trees proves that they grew some distance from the sea-board; as well as off the coasts of Essex and Lincolnshire. It would include the

islands of Anglesea and of Wight (Fig. 95), and the estuary of the Thames to the west of a line drawn due

FIG. 95.—Neolithic Britain.

north from Felixstow. The other modification in the contour of Great Britain and Ireland consists of a narrow strip parallel to the present coasts. The forest of yew, oak, ash, birch, Scotch fir, and alder, extended from the Prehistoric sea-level up the mouths of the rivers, and joined that covering the general surface of the country. In the marshes of the lower Thames it is met with at a few feet above low-water mark.

This forest growth is proved to belong to the Neolithic division of the Prehistoric period by the presence of animals originally domestic, and introduced by the Neolithic tribes, the Celtic short-horn and the sheep or goat, as well as by the absence of the Pleistocene mam-

malia. It must not be confounded with the older land surface, nearly at the same horizon, and containing the remains of the mammoth, at St. Audries, near Watchet, in Holyhead Harbour, and off the coast of Yarmouth. Still less must it be confounded with the yet older land surface under the boulder clay of Norfolk and Suffolk, in which are discovered the southern elephant and the other animals described in the sixth chapter of this work. The southern elephant lived in Europe before the mammoth, and the mammoth became extinct before the introduction of the domestic animals. The faunas to which these animals respectively belong indicate the relative antiquity of the three ancient land surfaces containing their remains, which cannot be ascertained in any other way.

Climate.

The forests and morasses would probably cause the Prehistoric climate to be more damp than that experienced in Britain since the dawn of history; while the larger area of land would produce a greater contrast between the temperature of summer and winter. The presence of the reindeer and the elk as far south as the valley of the Thames points to the same conclusion. The Prehistoric geography, indeed, as well as the climate, represents a middle stage in the series of changes which Britain has undergone in its passage from a continental condition and climate to its present state.

This view is considerably strengthened by the evidence brought forward by Dr. James Geikie as to the geography and climate of North Britain at the time when the forests now submerged were living. "No island," he writes, "of the Orkney or Shetland groups

can boast the presence of any natural trees deserving of the name. Cultivated saplings are protected by walls, but they cannot raise their tops above the level of the copestones. And yet the mosses and sunk forests of those regions abound with fallen trees, many of which equal in thickness the body of a man. When these buried trees decked the now bleak island with their greenery, the land stood at a higher level, and the neighbouring ocean at a greater distance. A study of similar appearances in the Inner and Outer Hebrides will induce us to form a like opinion of the changes which they indicate. The broad barren flats of Caithness were also in ancient times overspread with a thick growth of large-sized natural wood, the peat mosses containing which pass below the sea. To have permitted this strong forest growth we are again compelled to admit a former elevation of the land and a corresponding retreat of the ocean. And so on of all the maritime regions of Scotland.

"The same inferences may be drawn from the facts disclosed by the mosses of Ireland and England. On the coasts of France and Holland, as I have said, peat dips underneath the sea; and along those bleak maritime regions of Norway, where now-a-days the pine-tree will hardly grow, we find peat mosses which contain the remains of full-grown trees, such as are only met with in districts much farther removed from the influence of the sea."[1]

From the great thickness of the bark of the Scotch firs in the buried forests, Dr. Geikie infers that the climate was more severe when the trees were alive than now, and more like that of the wooded regions of

[1] *Trans. Roy. Soc. Edinburgh*, xxiv. p. 363. See also *The Great Ice-age*, c. xxvi.

Canada than that which characterises Germany at the present time. Mr. Godwin Austen draws the same conclusion, from the thick bark of the trees, in his memoir on the "Superficial Accumulations of the Coasts of the English Channel."[1]

Prehistoric Mammalia in Britain and Ireland.

The mammalia inhabiting Great Britain and Ireland in the Prehistoric period may be divided into three groups — the wild species which have survived from the Pleistocene age; those which have been introduced under the care of man; and lastly, the domestic animals which have reverted to a wild state. In the forests and woodlands then covering the British Isles, and extending to a little distance beyond the present coast-line (Fig. 95), were wild boars, horses, roes and stags, Irish elks, true elks, and reindeer, and the great wild ox, the urus, as well as the Alpine hare, the common hare, and the rabbit. Wolves, foxes and badgers, martens and wild cats, were abundant; the brown bear, and the closely allied variety the grisly bear, were the two most formidable competitors of man in the chase. Otters pursued the salmon and the trout in the rivers, beavers constructed their wonderful dams, and water rats haunted the banks of the streams. These constitute the first group of survivals from the Pleistocene age.

The Irish elk[2] demands especial notice among the Prehistoric wild animals from its vast numbers in Ireland, as well as from the fact that it is the sole survivor from the Pleistocene into the Prehistoric age, which

[1] *Quart. Journ. Geol. Soc. Lond.* vii. 118.

[2] Hart *Descrip. of Fossil Deer of Ireland*, 2d ed., 1830, p. 13.

has since become extinct. Very generally the bones are found in juxtaposition, so as to prove that their possessors had been bogged. In one case Archdeacon Maunsel described in 1825 two heads, with the antlers interlocked in a fight between two bucks, in which both perished.

Sometimes the Irish elks have been drowned, and their bones distributed by water. In Ballybetagh bog, near Dublin, the heads are frequently found lying together and apart from the rest of the bones of the skeleton, a circumstance which, as Mr. E. J. Moss[1] pointed out to me, cannot be accounted for except by the above hypothesis. The rarity of the animal in Britain forms a marked contrast with its abundance in Ireland. It has been discovered in the peaty-mud near Newbury, in Berkshire, and in the marl below the peat in the parish of Maybole, Ayrshire.

The Irisk elk is proved from recent discoveries by Mr. R. J. Ussher, in a cave near Cappagh, Cappoquin, Waterford, to have been hunted, as well as the reindeer, by man; but the age of the strata in which it is found appears to me to be doubtful. The perforated rib in

[1] My thanks are due to this gentleman, and his brother, Dr. Moss, for their courtesy and kindness in having excavations made to show the exact position of the remains in the bog, at the meeting of the British Association at Dublin in 1878. The bog occupies the site of a tarn, and rests on the boulder clay. Above the latter is a thin layer of blue fluviatile clay, which, as it passes up towards the peat, becomes more and more mingled with black, peaty material. The animal remains rested in and on the blue clay, passing upwards through the peaty mud; in one case, which I have examined, the antler tips were within six inches of the upper friable black peat. Prof. Leith Adams believes that Irish elks have never been met with in peat bogs. There are, however, many cases on record of their occurrence in peat, and Mr. Kinahan, whose experience in Irish geology is second to none, informs me that they do occur in the Irish peat.

the museum at Dublin, which is sometimes taken to be the result of a wound from a dart,[1] arrow, or spear, may possibly have been caused by one of the sharp tynes in a fight between two bucks. The peculiar incised bones[2] also from Legan, County Longford, which at first sight look as if they had been cut by man, have been proved by Dr. Carte to have resulted from the friction of one bone resting on another, caused by a movement in the strata in which they were found.

The urus was comparatively abundant in Prehistoric Britain and Ireland, and its remains are met with more especially in the sub-turbary marls and in the alluvia. It is proved to have been hunted by Neolithic man by the bones and teeth in the Neolithic pit in Cissbury Camp, explored by Mr. Ernest Willett in 1874. It lived in this country at least as late as the Bronze age, since its remains occur in the refuse-heap in and around the pile dwelling in Barton Mere, near Bury St. Edmunds. From these two isolated cases of its occurrence in Britain it may be inferred that it was very rare in the Neolithic and Bronze ages; it probably was exterminated before the Historic period in this country. The "*tauri sylvestres*" of William Fitzstephen,[3] in the forests then extending round London, probably did not refer to the urus, but to half-wild descendants of cattle turned out, as was then the custom, into the woodlands to feed, and not confined within the limits of fences.[4] Mr. Darwin, however,

[1] Hart, *op. cit.* pl. ii. Richardson, *Nat. Hist. of Gigantic Irish Deer*, 1846, pp. 22, 25.

[2] *Journ. Royal Geol. Soc. Ireland*, 8th March 1866.

[3] *Vita Sancti Thomæ*, i. p. 170, 8vo edit. E. A. Giles, Oxoniæ.

[4] Dawkins on "British Fossil Oxen," Part I. *Quart. Journ. Geol. Soc. Lond.*, 21st March 1866.

considers that the Chillingham cattle are the half-tame descendants from a long ancestry of wild British uri; and this view we shall examine in the fourteenth chapter, in dealing with the British mammalia in the Historic period. The urus, however, lived in the forests covering Central Germany as late as the sixteenth century.

The moose, or true elk, has been met with in several localities in the peat bogs of Northumberland, and in Yorkshire. In 1871 my attention was drawn to a magnificent head, with the antlers, found in 1828 near Williestruther Loch, Hawick, by Sir Walter Elliot, Bart., its present possessor. A second skull, obtained from Berwickshire, was exhibited at the British Association in Edinburgh by Dr. G. A. Smith, to whom we are indebted for an essay[1] on these and many other specimens, which prove that the animal was by no means uncommon in North Britain. In the south it has been found only at Walthamstow, along with the goat, Celtic short-horn, and reindeer.[2]

The reindeer occupied the same parts of Prehistoric Britain as the moose. In the south it has been found in the Thames valley, at the southern outfall near Erith, along with the beaver, Celtic short-horn, goat, horse, and a human skull, at the bottom of a layer of peat, fifteen to twenty feet in thickness; and it has been discovered under similar conditions in the excavations carried on for the Victoria Docks.[3] Rare in England, it is proved

[1] *Proceed. Soc. Antiq. Scot.* ix. 52. [2] *Geol. Mag.* vi. 339.

[3] A fine antler was obtained from the clayey gravel below the peat, by Mr. Andros, in these excavations on the north side of the Thames. It was exhibited, on 26th February 1879, at a meeting of Erith and Belvedere Nat. Hist. Society.

by Dr. J. A. Smith to have been comparatively abundant in Scotland; and the discovery of its bones in the refuse-heaps at Caithness leave no room for doubting that the animal was used for food by the inhabitants of the neighbouring *burghs*, or massive circular dwellings. It is comparatively abundant in the peat bogs and marls of Ireland.

The wild urus is not known in Ireland, the larger skulls of oxen, not referable to the Celtic short-horn, belonging to the large domestic breed, which was probably introduced by the Scandinavian invaders between A.D. 500 and 1000. Nor have any remains of beaver or common hare been discovered in any Irish deposit of Prehistoric age.

The second group of Prehistoric animals consists of the dog, horned sheep, goat, Celtic short-horned ox, and hog, introduced by Neolithic man, and which will be treated in discussing his position as a herdsman. The third group consists of the short-horned ox, the turf-hog, and the goat, which escaped from the servitude of man and reverted to a wild state in the virgin forest, as yet untouched by the axe of the woodman, in the same manner as they have become wild in North America and in Australia. Possibly the horse also may have reverted equally to a wild state, but it may have descended from the wild horses so abundant in Britain in the Pleistocene age.

LIST OF PRINCIPAL PREHISTORIC MAMMALIA OF BRITAIN AND IRELAND.

Wild Animals.

	Britain.	Ireland.
Man	×	×
Beaver	×	—
Hare	×	—

	Britain.	Ireland.
Alpine Hare	×	×
Rabbit	×	×
Water Rat	×	—
Wild Cat	×	×
Otter	×	×
Marten	×	×
Badger	×	×
Brown Bear	×	×
Grisly Bear	?	×
Wolf	×	×
Fox	×	×
Horse	×	×
Roe	×	—
Stag	×	×
Elk	×	—
Irish Elk	×	×
Reindeer	×	×
Urus	×	—
Wild Boar	×	×
Domestic Animals.		
Dog	×	×
Horse	×	×
Sheep	×	×
Goat	×	×
Short-horn	×	×
Hog	×	×

The Prehistoric and Historic Periods belong to the Tertiary.

If this list[1] of animals be compared with that of the late Pleistocene mammalia, p. 147, it will be seen that seventeen Pleistocene species are no longer repre-

[1] The principal writers consulted in making the list for Ireland are Sir W. Wilde, Dr. Ball, Dr. Scouler, and Mr. Scott, in whose catalogue, published in the *Journ. Geol. Soc. Dublin*, Feb. 10, 1864, the detailed references will be found; also Mr. Thompson, *Nat. Hist. of Ireland*, vol. vi.

sented in Britain. The spotted hyæna, lion, lynx, Caffer cat, and hippopotamus, have taken refuge in the southern climates; the lemming, glutton, pouched marmot, musk sheep, and tailless hare, have retreated either to the north, or to the shelter offered by the forests of Central Europe, or the tops of lofty mountains; while the cave-bear, woolly rhinoceros, leptorhine rhinoceros, mammoth, and straight-tusked elephant (*E. antiquus*), have become extinct. On the other hand, it may be concluded from the fact that all the wild Prehistoric mammals were living in the preceding age, that the Prehistoric period is not cut off from that which went before by a line of demarcation such as that dividing the Secondary from the Tertiary periods. The wild fauna and flora of Prehistoric and Historic Europe may be traced back to the Pleistocene age, and therefore the Tertiary period must be looked upon as not ending with the Pleistocene, but as extending down to the present day (see Fig. 1).

Magnitude of Interval between the Pleistocene and Prehistoric Periods.

Such changes in the mammalia and in the geography of Britain as those described in the preceding pages, in the interval separating the Pleistocene from the Prehistoric period, could not have taken place in a short time, and when we reflect that comparatively little change has taken place in this country during the last two thousand years, it is obvious that the one period is separated from the other by the lapse of many centuries. Of how many we cannot tell. The sharp line of demarcation between the two is to be noticed in almost every

river-valley, where both are close together; the Pleistocene fluviatile strata occurring in various levels, either above or below the present level of the stream, while the Prehistoric deposits consist of alluvia close to the present level of the stream, or of subaërial accumulations of loam and the like, the result of the rain-wash, covering the lower grounds like a mantle. In the former the severity of the winters is marked by the confused manner in which the pebbles have been accumulated, owing to the floating ice in the streams; while in the latter the sediments are sorted by the ordinary action of running water, without the intervention of ice. The line of demarcation is equally clear in the caverns,[1] in which the late Pleistocene accumulations are generally mapped off from those of the Prehistoric age by a layer of stalagmite, sometimes of considerable thickness. This, however, offers no measure of the interval between the two periods, because the rate of accumulation depends upon the currents of air in the caves, and the amount of water passing through the limestone, both of which are variables. In the Ingleborough cave, in Yorkshire, it has been so swift that between 1845 and 1873 a stalagmitic boss known as the Jockey Cap has grown at the rate of ·2941 inch per annum. In Kent's Hole it has been so slow that an inscription bearing the date of 1688 on a similar boss is only covered by a film not more than one-twentieth of an inch in thickness. It therefore follows that very great thicknesses may be formed in a short time; while on the other hand it may take a long series of centuries to form a thin layer of a few inches.[2]

[1] *Cave-hunting*, c. viii.

[2] *Cave-hunting*, p. 439; Pengelly, *Kent's Cavern*, Science Lectures for

Comparative Duration of Pleistocene and Prehistoric Periods.

We may obtain a rough approximation to the relative length of the Pleistocene and Prehistoric periods from the fact that the valleys were cut down by the streams flowing through them; in the former, sometimes as much as a hundred feet, while the work done by the rivers during the latter is measured by the insignificant fluviatile deposits close to the adjacent stream.[1] It may therefore be concluded that the former period was beyond all calculation longer than the latter. The latter, however, may have been of very considerable length, since it includes a series of changes in the fauna, and a series of invasions of different races of men into Europe, which, if measured by similar changes recorded in history, must have required the lapse of many centuries. In dealing with these questions it is only possible to grasp the relative duration, for the measurement of time absolute in terms of years outside the reach of history is beyond our power. We do not know the length of the interval separating any two events not recorded in history, nor are we possessed of any natural chronometer by which to fix a date in the historical sense. We are dealing merely with time relative, and not time absolute.

Neolithic Inhabitants of Britain and Ireland.

The great changes in the fauna and geography of Britain, at the close of the Pleistocene age, render it

the People, 1872, p. 19; *Reports of Kent's Cavern Committee; Brit. Ass. Reports*, 1865 to 1878.

[1] *Cave-hunting*, p. 267; Evans, *Ancient Stone Implements*, c. XXV.

very improbable that the Cave-men were in any way represented by the Neolithic tribes, who are the first to appear in Prehistoric Europe. The former possessed no domestic animals, just as the latter are not known to have been acquainted with any of the extinct species, with the exception of the Irish elk. The former lived as hunters, unaided by the dog, in Britain, while it was part of the continent; the latter appear as farmers and herdsmen after it became an island. Their states of culture, as we shall see presently, were wholly different. We might expect on *à priori* grounds that there would be an overlap, and that the former would have been absorbed into the mass of the newcomers. There is, however, no evidence of this. It seems far more probable that they were kept apart by the feelings of antipathy which we have described in the last chapter as existing between the Eskimos and the Red Indians. From the facts at present before us we may conclude that they belonged to two races of men, living in Europe in successive times, and separated from each other by an interval sufficiently great to allow of the above-mentioned changes taking place in the physical conditions of Britain.

Man, as he appears before us in the Prehistoric age, and in the Neolithic stage of culture, is far advanced in the upward path which mankind traversed in gaining the civilisation enjoyed by the higher races of the present time. His position may conveniently be ascertained by dealing first of all with his habitations.

Hut Circles.

In various parts of the country are to be seen clusters of circular depressions, very frequently within the ram-

parts of a camp, and on the summits of hills, and on the sides of the valleys where the soil is sufficiently porous to allow of drainage. These pits or "hut circles" are the remains of ancient habitations, dating as far back in this country as the Neolithic age, and in use, as proved by the discoveries at Standlake, and at Brent Knoll, near Burnham, as late as the time of the Roman occupation. Those at Fisherton, near Salisbury, explored by Mr. Adlam, and described by the late Mr. Stevens in 1866, may be taken as typical of the whole series. They occur singly and in groups, and are carried down to a depth of from seven to ten feet through the superficial gravel into the chalk, each pit or cluster of pits having a circular shaft for an entrance. At the bottom they vary from five to seven feet in diameter, and gradually narrow to two and-a half or three feet in diameter in the upper parts. The floors were of chalk, sometimes raised in the centre, and the roofs had been made of interlaced sticks coated with clay imperfectly burned. The most interesting group consisted of three circular pits, and one semicircular, communicating with each other, with a shaft-like entrance on the north side.

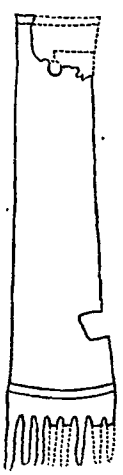


FIG. 96.—Bone Weaving-comb, Fisherton.

The contents of these pits afford a clear insight into the condition of their ancient inhabitants. A spindle-whorl of burnt clay implies a knowledge of spinning, while two dressed lumps of chalk with holes drilled in them are considered by Mr. Stevens to be the weights which may have been used to give tension to the warp threads in weaving, like those found in the Swiss pile-dwellings. Two curious

combs, six inches long, with short thick teeth and long handles (Fig. 96), were used in weaving. A bone needle with drilled eye implies sewing. Fragments of pottery, not turned in the lathe, plain, or ornamented with incised curves, right lines, or lines of dots, prove a knowledge of the potter's art. They were also cultivators of the ground; for Dr. Blackmore discovered a cast of a grain of wheat in the clay which had formed a portion of the cover of one of the pits; and two concave stone grain-rubbers or "mealing-stones" for grinding corn show an acquaintance with agriculture.

The remains of the animals in the pits belong to wild and domestic species: for on the one hand we have the stag; and, on the other, the dog, goat, short-horn (*Bos longifrons*), horse, and pig, besides smaller animals and fishes. We may, therefore, infer that the inhabitants were also hunters, fishermen, and keepers of flocks and herds.

The Neolithic age of these accumulations is proved by a roughly clipped celt, besides large quantities of broken flint and an arrow-head. No trace of metal was discovered.[1]

This form of subterranean habitation is still used by native tribes in the interior of Africa. The eminent explorer Mr. H. M. Stanley describes "deep pits with small circular mouths, which proved on examination to lead to several passages from the mouth of the pit to more roomy excavations like so many apartments,"[2] which are used for dwellings in Southern Unyoro.

[1] *Wiltshire County Mirror*, June 20, 1866.

[2] *Through the Dark Continent*, i. p. 432.

Log Houses in Ireland.

In the Museum of the Royal Irish Academy a model is preserved of a log hut, discovered in 1833 in Drumkelin

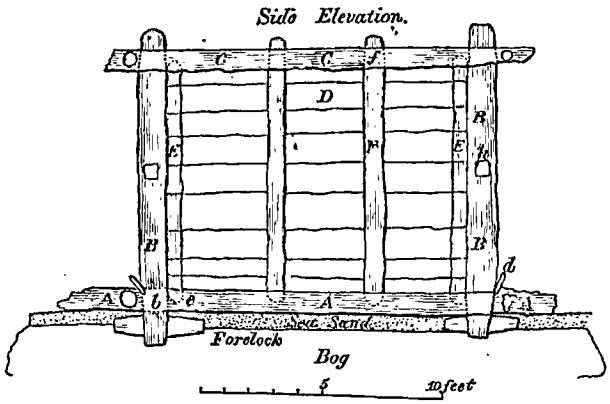


FIG. 97.—Log House, Drumkelin Bog, Donegal.

bog, Inver (Donegal),[1] made of rough logs and planks of

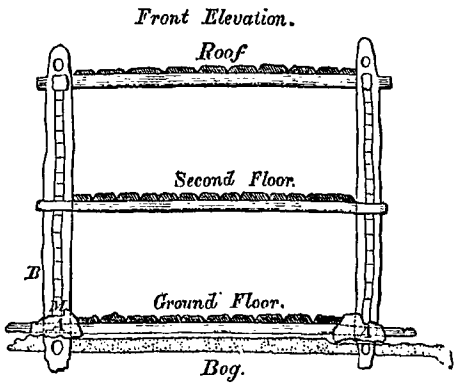


FIG. 98.—Log House, Drumkelin Bog, Donegal.

oak timber (Figs. 97, 98), split with "wedges," twelve feet square and nine feet high. "The framework was com-

[1] Captain Mudge, *Archæologia*, xxvi. p. 361, pl. 47.

posed of upright posts and horizontal sleepers, morticed at the angles, the end of each upright post being inserted into the lower sleeper of the frame and fastened by a large block of wood or forelock."[1] The mortices were roughly made with a blunt instrument, the wood being bruised rather than cut; and, oddly enough, a stone celt found in the house (like Fig. 99), according to Captain Mudge, corresponded exactly with the cuts of the tool used in forming the mortices and grooves. The logs had been cut with a larger instrument, also of stone. The house consisted of two stories, one over the other, each four feet high. It stood upon a stratum of bog fifteen feet deep, which had been covered by a layer of hazel bushes, and that by a layer of fine sand, before the building had been begun. On the ground-floor, besides the stone axe above mentioned, there was a grindstone hollowed in the centre by rubbing. "A paved causeway, resting upon a foundation of hazel bushes and birchwood," led to the remains of a fireplace composed of slabs of free-stone, at fourteen yards' distance from the house, on which was a quantity of ashes. It appeared to have been surrounded by a staked enclosure. This house and the surrounding woodland growth of bog-willow, ash, and oak, lay buried under a depth of twenty-three feet of peat, the roof of the house being fourteen feet below the surface of the bog. It is the only example of a wooden cabin of the Neolithic age which is on record; and it may be looked upon as a type of one of the forms of habitation where timber was abundant, and where stone was not at hand for building circular or beehive huts, like the Scotch burghs. The huts were probably more

[1] Sir W. Wilde, *Cat. of Antiquities in the Museum of the Royal Irish Academy*, p. 235.

generally made of wattle-work, like those of the Swiss lakes; but of this work the only trace discovered in Britain is the fragment of the covering of the hut described above, at Fisherton.

From Captain Mudge's subsequent discoveries it is very probable that this is one of a group of wooden houses, connected with each other by paths, and surrounded by a breastwork about five feet high, made of rough spars piled up and compacted together by stakes driven into the bog. He found the sill of a door, and, about a hundred and fifty feet off, two doors or gates cut out of solid logs of oak lying side by side, of which one was perfect, being four inches thick, two feet seven inches broad, by four feet six inches long, with a piece of solid wood protruding at each end to act as pivot to the hinges. From their size it may be inferred that they belong to one of the cabins. A flint arrow-head, two inches long, and "a wooden sword" have also been met with in the peat close by.

The Neolithic inhabitants of Britain also used caves for habitation, such as those of North Wales (described in my work on *Cave-hunting*), the Victoria Cave in Yorkshire, and Kent's Hole in Devonshire. The refuse-heaps in each of these contain the remains of the same wild and domestic animals, and, in addition, those of the bear and the wild boar.

The Neolithic Homestead.

If we could in imagination take our stand on the summit of a hill commanding an extensive view, in almost any part of Great Britain or Ireland in the Neolithic period, we should look upon a landscape

somewhat of this kind. Thin lines of smoke rising from among the trees of the dense virgin forest at our feet would mark the position of the Neolithic homesteads, and of the neighbouring stockaded camp which afforded refuge in time of need; while here and there a gleam of gold would show the small patch of ripening wheat. We enter a track in the forest, and thread our way to one of the clusters of homesteads, passing herds of goats and flocks of horned sheep, or disturbing a troop of horses or small short-horned oxen, or stumbling upon a swineherd tending the hogs in their search after roots. We should probably have to defend ourselves against the attack of some of the large dogs, used as guardians of the flock against bears, wolves, and foxes, and for hunting the wild animals. At last, on emerging into the clearing, we should see a little plot of flax or small-eared wheat, and near the homestead the inhabitants, clad some in linen and others in skins, and ornamented with necklaces and pendants of stone, bone, or pottery, carrying on their daily occupations. Some are cutting wood with stone axes (Fig. 99) with a wonderfully sharp edge, fixed in wooden handles, as in Fig. 100, with stone adzes and gouges, or with little saws composed of carefully notched pieces of flint about three or four inches long, splitting it with stone wedges, scraping it with flint flakes. Some are at work preparing handles for the spears, shafts for the arrows, and wood for the bows, or for the broad paddles used for propelling the canoes. Others are busy grinding and sharpening the various stone tools, scraping skins with implements ground to a circular edge, or carving various implements out of bone and antler with sharp splinters of flint, while the women are preparing the meal with

pestles and mortars and grain rubbers, and cooking it on the fire, generally outside the house, or spinning thread

FIG. 99.—Neolithic Axe, Rhos-Digre Cave, ½.

with spindle and distaff, or weaving it with a rude loom. We might also have seen them at work at the moulding of rude cups and vessels out of clay which had been carefully prepared.

The Neolithic farmers used for food the produce of their flocks and herds, and they appear to have eaten all their domestic animals, including the horse and dog; the latter animal, however, probably only under the pressure of famine. They had also abundance of game

out of the forest, but it was rather an occasional supply, and did not furnish them with their main subsistence. The roe and the stag, probably also the elk and the reindeer, and in Ireland the Irish elk, provided them with venison; and the discovery of the urus in a refuse-heap at Cissbury by Mr. Ernest Willett, proves that that large wild ox was still living in the forests, and sometimes fell a victim to the Neolithic hunter. They also ate hares, wild boars, and beavers.

FIG. 100.
Stone Hatchet Robenhausen.

The Axe.

Of all the Neolithic implements, the axe was by far the most important. It was by the axe that man achieved his greatest victory over nature. Before it, aided by fire, the trees of the forest fell to make room for the tiller of the ground, and by its sharp edge wood became useful for the manufacture of various articles and implements indispensable for the advancement of mankind in culture. It was immeasurably superior to the rude flint hâche of the Palæolithic hunter, which could not make a straight cut in wood, and which was very generally intended for use in the hand, without any handle. It is therefore chosen as the symbol of the Neolithic culture.

Spinning and Weaving.

The arts of spinning and the manufacture of linen were introduced into Europe in the Neolithic age, and they have been preserved with but little variation from that period down to the present day in certain remote parts of Europe, and have only been superseded in modern times by the complicated machines so familiar to us. In the Neolithic household the spindle and the distaff were always to be found, and the circular perforated spindle-whorls, made sometimes of stone, and at other times of pottery or bone, are very commonly met with in the Neolithic habitations and tombs. The thread is proved by the discoveries in the Swiss lakes to have been composed of flax, and the combs (Fig. 96), which have been used for pushing the threads of the warp on to the weft, show that it was woven into linen on some kind of loom. It is very probable also that the art of making woollen cloth was also known, although from its perishable nature no trace of it has been handed down to us. These operations were probably carried on by the women, as was the universal practice among the classical peoples of the Mediterranean, as well as among the rude tribes of Africa, Asia, and America.

Pottery.

The fragments of pottery found in and around the habitations and tombs show that the Neolithic inhabitants of Britain and Ireland were acquainted with the potter's art. Their vessels are coarsely made by hand, and very generally composed of clay, in which small pieces of stone, or fragments of shell, have been worked.

They are brown, or black, in colour, and very generally have had rounded bottoms, from which it may be inferred that they were not intended to stand on tables, but were placed in hollows on the ground or floor. Sometimes they are ornamented with patterns in right lines or in dots.

The Neolithic Flint-Mines near Brandon.

The stone implements of the Palæolithic men were fashioned out of pebbles and boulders torn from the rocks by the elements, and ready to hand on the surface. The stones used by the Neolithic men for their implements were carefully sought beneath the ground. The flint out of which many of them have been manufactured was obtained by mining operations, carried out with great skill and ingenuity. Two of these mining centres in this country have been scientifically explored.

The series of workings at Grimes Graves, near Brandon, in Suffolk, explored by the Rev. W. Greenwell,[1] consists of shafts connected together by galleries from three to five feet high, which had been made in pursuit of a layer of flint good for manufacture. When the flint within reach was exhausted a new shaft was sunk close by, and a new set of galleries made; for the miners appear to have been ignorant of the use of timber to keep up the roof, and were therefore unable to work very far from the bottom of the shaft. The partially filled up shafts appear at the surface as circular depressions of the same form as the hut circles described above.[2] In the old workings the miners have left behind

[1] *Ethnol. Soc. Journ.* vol. ii. p. 419.

[2] This mode of mining was employed in Britain as late, if not later than

their tools—picks made out of stags' antlers (Fig. 101), polished stone celts, which fitted to the marks in the sides of the galleries, chisels of bone and antler, and little cups made of chalk evidently intended to contain grease for the supply of light. In one spot the roof had given way, and the tools were found just as they had been left at the working face by the miner, who was prevented from returning by the blocking up of the gallery.[1]

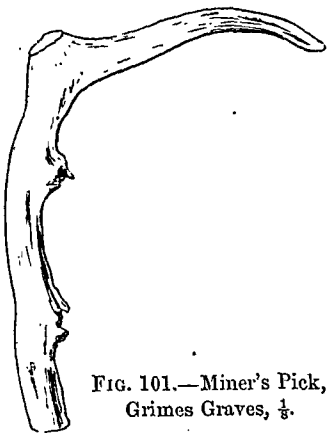


FIG. 101.—Miner's Pick, Grimes Graves, $\frac{1}{8}$.

On clearing this out, and when the end came in view, "it was seen that the flint had been worked out in three places at the end, forming three hollows extending beyond the chalk face of the end of the gallery. In front of two of these hollows were laid two picks, the handle of each towards the mouth of the gallery, the tines pointing towards each other, showing, in all probability, that they had been used respectively by a right and a left handed man. The day's work over, the men had laid down each his tool, ready for the next day's work; meanwhile the roof had fallen in, and the picks had never been recovered. I learnt from the workmen that it would not have been safe to excavate farther in that direction, the chalk at the point being broken up by

[1] the time of James the Second, in obtaining the iron ore, which made the iron trade of Kent and Sussex of such importance down to the close of the seventeenth century. The large woods in the neighbourhood of Hastings, in the direction of Battle, Brede, and Ashburnham, mark to a great extent the broken ground caused by these excavations, which cover considerable areas, and render them worthless to the farmer.

cracks so as to prevent the roof from standing firm. It was a most impressive sight, and one never to be forgotten, to look, after a lapse it may be of 3000 years, upon a piece of work unfinished, with the tools of the workmen still lying where they had been placed so many centuries ago. Between the picks was the skull of a bird, but none of the other bones. These two picks, as was the case with many of those found elsewhere, had upon them an incrustation of chalk, the surface of which bore the impression of the workmen's fingers, the print of the skin being most apparent. This had been caused by the chalk with which the workmen's hands became coated being transferred to the handle of the pick."[1]

In one of the pits was a large accumulation of the bones of animals, which were for the most part broken for the sake of their marrow, of the Celtic short-horn, the sheep or goat, the horse, the pig, and the dog. The bones of the short-horns belonged, with scarcely an exception, to young calves, while those of the dog belonged to aged animals, which were eaten by their masters after having become too old for hunting.

The Flint Implement Manufactory at Cissbury.

Another example of flint-mining on a large scale is offered by the shafts and galleries at Cissbury, a camp on a commanding position of the South Downs, about three miles from Worthing, explored by General Lane Fox,[2] Mr. Ernest Willett, and others. The surface of the ground in and around the circular depressions (see Fig. 102) is covered by innumerable splinters and by

[1] *Op. cit.* p. 427.

[2] "Hill Forts of Sussex," *Archæologia*, xlii. 1869.

implements in every stage of manufacture, from the nodule of flint fresh out of the chalk, spoilt by an un-

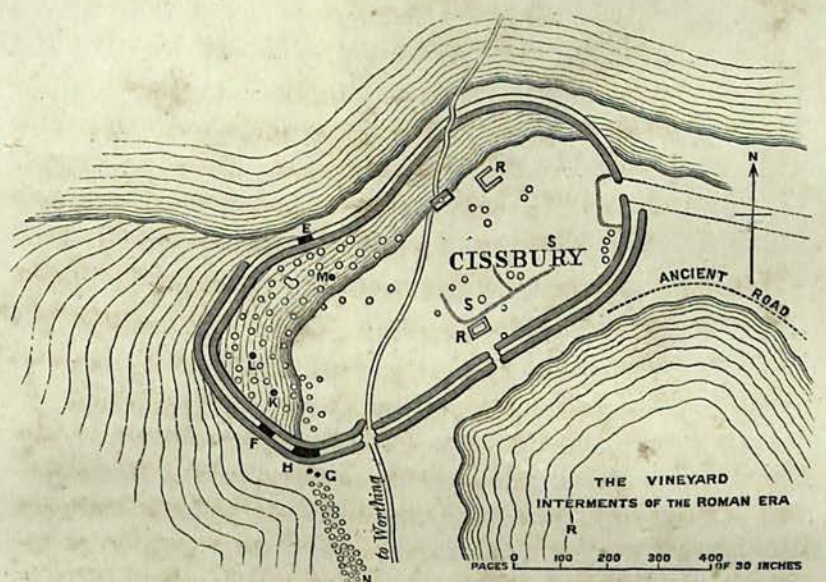


FIG. 102.—Cissbury Camp. E, M, L, K, G, N, Mine-shafts.

lucky blow, to the article nearly finished and accidentally broken. In some places Mr. Ernest Willett and myself remarked, in 1874, little heaps of small splinters which marked the places where the finer work was carried on, and in some of these were the two halves of the broken implements, just as they had been tossed aside by the workmen.

It was scarcely possible to pick these broken implements up and put them together without a keen feeling of the changes which had happened since they had been broken—the strange chance which led to their discovery. The Neolithic stage of civilisation had been superseded by that of Bronze; that in its turn by the age of Iron; then after an interval, the length of which we know not,

came the sequence of events recorded in the history of this country; and yet these little heaps, lying immediately beneath the greensward, had retained their places undisturbed, although the Romans used the camp at Cissbury for military purposes, and have left numerous traces of their occupation. From the time when they were made down to to-day there had been no appreciable change in the surface soil in which they rested. With this evidence before us, we cannot shut our eyes to the enormous lapse of time necessary for the production of the great geographical changes which took place in the interval between the Neolithic and Palæolithic ages.

Only some three or four, out of the thousands of implements found at Cissbury, bear traces of polishing, and these are broken; from which we may infer that they passed through the first stage of their manufacture at Cissbury, and were subsequently ground as they were wanted by the people who used them elsewhere. This was probably done at home on one of those grindstones generally found in Neolithic villages, like that, for example, discovered in the log house in Donegal.

Commerce.

It is obvious, from the existence of centres of mining and of manufacture, that the Neolithic tribes of Britain had commercial intercourse with each other. The implements were distributed over districts very far away from the places where they were made, probably by being passed from hand to hand, and tribe to tribe, in the same manner as copper kettles and other articles, coming from the Russians of Kamtchatka, find their way eastward among the Eskimos of West Georgia, and as

various European articles penetrate into the heart of Africa.

This kind of traffic is proved to have extended over enormous distances in the Neolithic age, by the distribution of the axes made of nephrite or jade, a material as yet unknown in its native state in Britain or on the Continent. The only places where it is known to exist in the old world are Turkestan and China, where from time immemorial it has furnished supplies to the Chinese and Tartars. It is very probable that jade was worked in this district in the Neolithic age, and transported through Asia, by the steady westerly drifting of the tribes; passing from hand to hand, and in the course of many ages arriving in Britain. Its value consisted not merely in its rarity, hardness, and beautiful green colour, but in the superstitious virtues attached to it in all ages and among all peoples; equally among the Chinese and the New Zealanders at the present time, and the ancient inhabitants of Europe. In the Neolithic age the axes made of it were put to no common use, but were frequently suspended as charms or ornaments, and this was the case also in the succeeding Bronze age.

Navigation.

The intercourse between the Neolithic tribes was greatly facilitated by the use of canoes, formed of the trunk of large trees, hollowed partly by the action of fire and partly by the use of the axe, and propelled by means of a broad paddle. There is no evidence of sails having been then known. It was probably in canoes of this kind, some of which are forty feet long, that the Neolithic peoples with their cattle and household stuff

crossed over into Britain from the nearest shores of the Continent, and from Britain to Ireland.

Warfare and Camps.

The numerous heads of javelins, arrows, and spears show that the Neolithic inhabitants of Britain and Ireland were frequently at war with one another, as is now the case with all lowly civilised tribes except the Eskimos. The club and the axe were used in hand-to-hand combat. For purposes of defence they constructed camps, with well-engineered ramparts either of stone or earth (Fig. 102), and fosses, sometimes as many as three or four ramparts being formed one above another.[1] The ramparts probably bore palisades, and were so placed as to enable their defenders to sweep the ground within range with their sling stones and arrows. It is clear then, as General Lane Fox has pointed out, that their owners were well acquainted with the art of war.

These camps, varying in size, are exceedingly abundant, and form, even in their present ruined condition, striking pictures in the landscape; as, for instance, that of Mount Badon near Bath, Old Sarum near Salisbury, and Caer Caradoc near Church Stretton. They were probably places of refuge belonging to a tribe or clan, which afforded shelter to the flocks and herds, as well as to their possessors, during the frequent raids which are universal among lowly organised communities. They cluster more thickly on the spots which command the fertile valleys—as, for example, the sides of the Severn and of the Dee, and on the Chalk-downs overlooking the rich "bottoms" of the southern counties. Each

[1] "Hill Forts of Sussex," *Archæologia*, xlii.

group of hills, writes General Lane Fox, in the South Downs, had a stronghold of its own, intended "to contain the inhabitants of the surrounding district, who dwelt in the valleys beneath, where fuel and water were obtainable, and where traces of their cultivation still exist, and who, like the savages of Africa and many other parts of the world, resorted to their strongholds in times of danger, each man carrying with him fuel, water, and provisions sufficient to sustain him until the foe retired."

Britain occupied by Tribal Communities.

The abundance of these camps gives us a clue to the social condition of the country at the time. The population was large, but it was split up into small tribal communities normally at war with each other, like the Afghans, the Kaffirs, or the villagers encountered by Mr. Stanley in his voyage down the Congo, each ready either to defend itself or to take the opportunity of attacking any of its neighbours. There was probably no strong central military power; but each tribe obeyed its own chief, whose dominion was limited to the pastures and cultivated lands protected by his fort, and extended but a little way into the depths of the forest, which were the hunting-grounds common to him and his neighbours.[1] There must have been social differences resulting from the possession of property, principally in the shape of flocks and herds; and the variation in size and in the contents of the burial-places shows that it was unequally distributed.

[1] The social state of Britain at this time is fairly represented in the well-known nursery rhyme of the marauding "Taffy," if for "house" we substitute camp.

Burial of the Dead.

The Neolithic tribes in Britain buried their dead sometimes in caves which had previously been used by them for dwellings, and sometimes in chambered tombs, which probably represent the huts of the living. Each of these was generally used as a vault common to the family or tribe, and contained skeletons of all ages. The interments are shown to have been successive and not simultaneous, from the bones being in various stages of decay, as well as from the fact that the bodies could not have been crowded together in the space in which the skeletons are found.

Fig. 103.—Long Barrow at West Kennet (restored by Thurnam).

The Neolithic tombs consist of barrows or cairns, varying in size, and long, oval, or circular in plan. The more important contain a stone chamber, built of slabs of stone set on edge, and very frequently with a narrow passage leading into it, which was also used for interments after the chamber was filled. The long barrows of Wiltshire, Somerset, and Gloucestershire are the most elaborate in this country; and some, as, for example, that of West Kennet (Fig. 103), are as much as 350 feet long. In this, as may be seen in the restoration by Dr.

Thurnam, there was a boundary wall of rubble stone from two to three feet high, with large upright blocks of stone placed at intervals, forming a peristyle like those surrounding the topes of India. Dr. Thurnam[1] calls attention to the fact that, according to Aristotle, the Iberian people were in the habit of placing as many obelisks

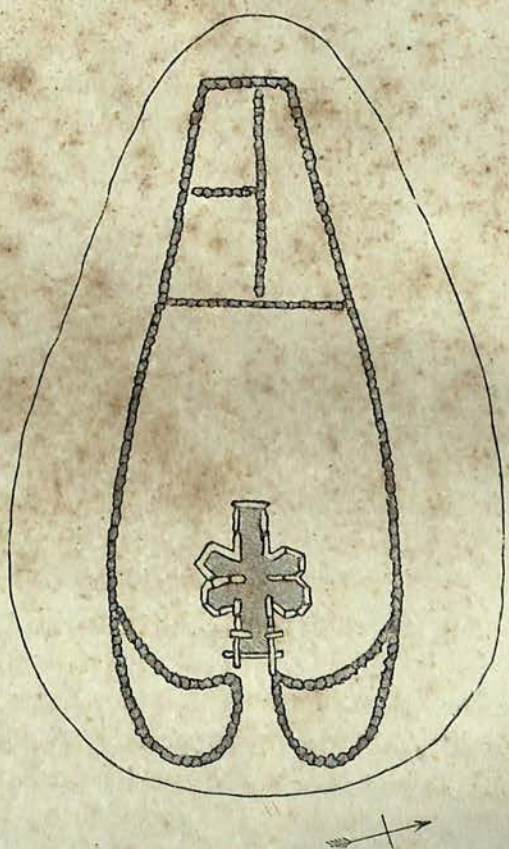


FIG. 104.—Plan of Long Barrow at Uley, Gloucestershire.

round the tomb of the dead warrior as he had slain enemies; and it is not without interest that a structure

[1] "Ancient British Barrows," *Archæologia*, xlii. p. 211.

of this sort has been remarked in Britain, since, in the next chapter, we shall see reason to believe on other evidence that the Neolithic inhabitants of our country were of Iberian stock. In some cases the chambered barrow was very complicated, as, for example, at Uley, in Gloucestershire. Not only is there a boundary wall laid in horizontal courses, faced on the outside, and carried up to a height of two or three feet, but at the small end within there are courses continued across, so as to divide it into three chambers (see Fig. 104). At the larger end the outer wall curves gracefully inwards

FIG. 105.—Entrance to Long Barrow, Uley.

until it reaches the doorway (Fig. 105). Inside, a narrow passage leads to the tomb proper. The entrance was originally on the outside closed by a block of stone.

There are, as might be expected, many modifications of the form of the chamber; sometimes it is cruciform, at others it is divided into a series of niches, or takes the form of a long passage. In some cases the stone chambers are isolated from each other within the tumu-

lus. Kits Cotty House, in Kent, and Wayland Smith's Cave, are still simpler forms, without a gallery.

The dead were buried in these tombs as they died, in a contracted or crouching posture, which is probably due, as Mr. Evans suggests, to their sleeping in that position, and not at full length on a bed. In the caves and tumuli which I have examined, I have been unable to detect any regularity in the position, although very generally the corpse had been interred on its side. Dr. Thurnam believes, from the many cases in which he has met with cleft skulls, that human sacrifices were offered, as was the habit among the Gauls, according to the testimony of Cæsar and Mela.[1] Domestic animals were also slaughtered, and were eaten with the wild animals, such as the boar, roe, and stag, in honour of the dead. In the barrow of Tilshead Lodge[2] were two skulls of the Celtic short-horn, nearly perfect; and in another barrow were part of a skull and a number of bones of the feet in their natural positions. In both these instances it would appear that the heads and feet were thrown on the yet incomplete barrow, "as offerings to the manes and other deities."

The Belief in a Future State.

Implements of various kinds, flakes, arrow-heads (Figs. 106, 107, 108), scrapers, celts, and pottery, are very generally found in the tombs, and probably were intended for the use of the dead. Sometimes they have been purposely broken, so that they might be of no use to the living, and from the idea that the spirits of the

[1] Cæsar, vi. 19; Mela, iii. 2.

[2] Thurnam, *Archæologia*, p. 22.

things might join the dead in the world of shadows. Some large and important chambered tombs, however,

FIG. 106.—Walker's Hill.

FIG. 107.—Rodmarton.

FIG. 108.—Rodmarton.

Leaf-shaped Arrow-heads from Chambered Long Barrows, ½.

which must have been made at considerable cost of labour, contain remarkably few implements, and this may be due to the custom of burying models, of some perishable material, of the valuables of the deceased. At the present day wooden models are sometimes placed in the hut of the dead by the Eskimos, and bank notes and imitation dollars, made of paper covered with silver foil, are burnt by the Chinese to enrich the spirit of the dead. In the Etruskan tombs jewels were placed, too thin and fragile to be serviceable to the living. If this practice were carried on in the Neolithic age, the models would have perished without leaving a trace behind. It must also be observed that the large size of a tomb may be due to its having been prepared by a great man for himself during his own lifetime, after the

manner of the builders of the Egyptian pyramids, while the few articles placed in it with his body may perhaps measure the value placed upon him by the survivors.

The view that the tombs and their contents imply a belief in a future state is fully borne out by an appeal to almost universal habits and modes of thought, current equally among civilised and barbarous peoples.[1] The tomb was, to the Neolithic mind, as truly the habitation of the spirits of the dead as the hut was that of the living. It was the home of the dead chieftain, and the centre into which the members of the family or clan were gradually gathered, and where they led a joyous and happy life similar to that which they enjoyed on the earth. Hence the offerings made to them, and the superstitions which have clustered round them, to be remarked among the survivals from the Neolithic age into the Historic period. The little cups, bowls, basins, and hollows on some of the slabs of the stone chambers of the tombs were probably intended to hold offerings made to the spirits of the dead, such as those on the capstone of the cromlech[2] at Bonnington Mains, near Ratho, a few miles west of Edinburgh, on one of the props of the cromlech at L'Ancresse, Guernsey,[3] and in many other localities.[4]

[1] See Tylor, *Primitive Culture*, chaps. xi. to xvii.

[2] Wilson, *Prehistoric Annals of Scotland*, i. p. 95, 2d edit.

[3] Lukis, *Journ. Brit. Archeol. Ass.* iii. p. 342; *Archæologia*, xxxv. p. 232.

[4] Simpson, *British Archaic Sculpturings*. Edinburgh, 1867.

General Conclusions as to Neolithic Culture in Britain.

From the preceding pages the reader will gather a distinct idea of the physical condition of Britain in the Neolithic age, and of the manners and customs of the inhabitants. The population was probably large, divided into tribal communities possessed of fixed habitations, and living principally on their flocks and herds, acquainted with agriculture, and subsisting in a lesser degree by hunting and fishing. The arts of spinning, weaving, mining, and pottery-making were known, and that of boat-building had advanced sufficiently far to allow of voyages being made from France to Britain, and from Britain to Ireland. Traffic was carried on by barter, and stone axes were distributed over areas far away from those in which the stone was found. Tombs also were built, some of imposing grandeur, for the habitation of the dead in the after-world, in which the spirits were supposed to lead a life not very different from that of the living, and at which they were worshipped by the family or tribe, after the manner of the Red Indians and many African peoples.

Neolithic Civilisation on the Continent.

The traces of this civilisation have been discovered in almost every part of Europe, under conditions which prove that the manners and customs of the people were tolerably uniform, and only presented those minor differences which may be noted in the social state of the present inhabitants. We may survey them from the standpoint offered by the discoveries made in the pile-dwellings of Switzerland, and at the same time com-

plete our ideas as to the Neolithic civilisation of Britain.

In the year 1829[1] an excavation for the sake of deepening the harbour at Ober Meilen, on the lake of Zurich, revealed the existence of piles and other antiquities, which, however, excited as little interest at the time as the discoveries in Kent's Hole, which were being made by Mr. MacEnery about the same date. Their importance was recognised in the year 1854. From that time down to the present day researches have been carried on in many of the lakes of Switzerland, Italy, and Austria, which have resulted in proving that a large population dwelt in houses built on platforms, at a short distance from the shore, in the Neolithic, Bronze, and Iron Ages, and in Switzerland as late as the first century after Christ.[2] In most cases the habitations had been burnt, and the platforms, with what remained of the huts and of the household stuff, had dropped down to the bottom of the lake, and, together with the refuse and the various articles lost from time to time, constituted a relic bed, which places before us the manners and customs of the inhabitants in most extraordinary detail. In some cases this had happened repeatedly, each conflagration being marked by its layer of ashes and charred piles.

The artificial platforms for the huts were built sometimes on piles interlaced with timbers, and sometimes on bundles of brushwood, or fascines, occasionally weighted with clay or stone, and were connected with the land by a narrow causeway. They were intended

[1] Keller, *Lake-dwellings*, transl. by J. E. Lee, 8vo, 2d. edit. p. 11.

[2] A coin of Claudius was found with other coins in the pile-dwelling of Marin. Keller, *Lake-dwellings*, transl. by J. E. Lee, 2d. edit. p. 427.

for defence, and it is an interesting point to note that when the means of attack were improved in the Bronze age, the settlements were built at a greater distance from the margin, so as to be farther away from the reach of the slingstone and of the arrow. In other words the attack and defence kept pace with each other, just as is the case at the present time with the large guns and the armour plates. Similar habitations[1] are described by Major Burton[2] in Dahomey, and by Captain Cameron[3] in Lake Mohrya, as the homes of certain African tribes, and they were used in Asia Minor in the Apamæan lake[4] as late as the middle of the fourteenth century, by the "Christian fishermen who live here on the lake in wooden huts built on piles." According to Herodotus, the pile-dwellings on Lake Prasias afforded to their inhabitants a secure protection against the arms of the Persians under Megabazus, in the march to the Hellespont and the conquest of Thrace.[5]

The pile-dwelling of Robenhausen,[6] which lies buried in a peat-bog on the south side of Lake Pfäffikon, may be taken as an example of one of these communities in the Neolithic age in Switzerland. It consisted of a platform made of timbers and roughly-hewn boards, fastened to upright piles by wooden pins, occupying an irregular quadrangular space about three acres in extent, and about 2000 paces from the old shore. On this

[1] Keller, *Lake-dwellings*, transl. by J. E. Lee, 8vo, 2d. edit. pp 496-500.

[2] Burton, *Mem. Anthrop. Soc. Lond.* i. p. 311.

[3] Cameron, *Across Africa*, 8vo, 1877, ii. p. 53.

[4] See Hitzig, *Supplementa Tabulæ Syriæ*, c. ii.; quoted by Keller, *Lake-dwellings*, p. 497.

[5] Herodotus, v. 16.

[6] For the history of pile-dwellings, see Keller, *op. cit.*

were built wooden huts with thatched roofs, 27 feet long by 22 wide, and between them were the cattle-pens, sheep-folds, and pig-sties. The remains of six of these huts were exposed in digging a canal, in a space of 150 feet long by 40 feet broad. In this at six different points at equal distances were little heaps of corn, pieces of woven and plaited cloth, stores of raw flax, together with a mealing stone, and also six groups of stones which had formed the hearths. It is evident, therefore, as Mr. Messikomer observes, that each was inhabited by one family, which had its own arrangements for preparing victuals and making clothes, and we may conclude that the whole settlement was not a community with common store-houses like a Mexican pueblo. The litter for the cows was chiefly of straw and rushes, and that for the sheep, pigs, and goats, of sprigs of fir and twigs of brushwood. In one place a considerable quantity of ears of wheat and barley was found along with bread; in another corn and bread with burnt apples and pears; in a third flax in hanks or skeins, spun and plaited into cords, nets, and mats, and woven into cloth, along with earthenware weights for the loom. The corn had been reduced to meal in mortars or on mealing stones, and afterwards either made into porridge, or into little round loaves baked on hot stones, or under the embers. It was also eaten parched. Caraway and poppy seeds were also used, probably for flavouring, and a small round cake of the latter was discovered, which may have been intended for use as a narcotic.

The villagers of Robenhausen also laid up stores of the water-chestnut, the common nut, the walnut, and apples, of which no less than 300 were found together

beech-nuts and acorns, which were probably intended as food for the swine; as well as the raspberry, strawberry, elderberry, blackberry, the cherry and sloe. Fragments of pottery were very abundant, as well as various implements of stone, antler, and bone, of the kind described above, and sometimes with the handles of wood preserved in a perfect condition (Fig. 100). Fragments of leather prove that they were acquainted with the art of tanning, and a wooden last that they were in the habit of making shoes or sandals to measure. There were also wooden bows, bowls, and various other articles, which are only preserved under very exceptional circumstances. The asphalt of the Val de Travers, now so commonly employed for pavements, was used for cementing the stone implements into their handles, and the fires were lighted by means of a flint flake and a piece of iron pyrites, used in the same manner as "the flint and steel" of the present time.

The large quantities of bones thrown away in the refuse-heap at the bottom of the lake show that the villagers lived on the wild animals of the district, as well as on their flocks and herds, and the produce of their fields and gardens. They also ate large quantities of fish. The domestic animals, with the exception of the large oxen, were of the same breeds as those kept in Neolithic Britain, and of these at least three—the swine, the sheep, and the cows—were kept in pens close to the huts of their owners.[1]

[1] Keller, *op. cit.* p. 50. Their excrements form a layer varying from two to ten inches in thickness, mixed with litter.

The Domestic Animals.

The interest of these discoveries in Switzerland does not merely consist in their enabling us to realise that the civilisation of Britain was closely related to that of Switzerland, and to obtain a more just idea of the Neolithic peoples, but in the light they throw on the origin of the domestic animals and of the cultivated fruits. In discussing these questions it will be necessary to examine the independent testimony of each breed.

The Dog.

The dog of the Neolithic age in Switzerland was about equally remote from the wolf and the jackal, and intermediate in size between a hound and a spaniel.[1] There is no reason for supposing that it was descended from the European wolf; but Mr. Darwin's view[2] is probably correct, that it may have been derived from an extinct form which had been imported from some other region. Its nearest native ally, in the wild state, is the jackal, an inhabitant of the warm regions of South-eastern Europe and of Southern and Central Asia; and it is therefore probable that the breed of dogs was originated under the care of man in one of those countries.

The Hog.

The two breeds of hogs, the turf-hog (*Sus palustris*), or Torfschwein of Rütimeyer, and the common domestic pig (*Sus scrofa domesticus*), found in the pile-dwellings,

[1] Rütimeyer, *Die Fauna der Pfahlbauten*, 4to, 1861, pp. 117-162.
[2] Darwin, *Variation under Domestication*, i. p. 19.

represent the extremes, from the interbreeding of which our present domestic hogs are derived. The first of these is considered by Professor Rütimeyer and Mr. Darwin to have been originally wild in Europe, because it is found along with wild animals at the bottom of peat-bogs, and because its bones are traversed by more strongly defined ridges and grooves, as in the case of wild as distinguished from domestic animals. It is certainly true that the muscular development, rendered necessary by the struggle for life between wild animals, enables us to distinguish the wolf from the dog, or the wild from the domestic oxen; but it is not a sure guide to the definition of the wild from the domestic hog, since the looseness of the texture in the bones of the hogs, and the absence of strongly pronounced ridges, are almost as great as in the elephants. Professor Rütimeyer's test will not, moreover, enable us to discriminate between the animals which have been aboriginally wild and those which have escaped from the yoke of man to revert to the feral conditions of life. In the latter case, the animal must exert its muscular powers in acquiring food and in defending itself against its enemies, by which the *points d'appui* of the muscles must be correspondingly strengthened. Nor can its aboriginal wildness be inferred from its wide distribution through Europe, because, at the present time, the swine introduced into North and South America and Australia by the colonists are gradually spreading over those countries. Under favourable conditions of life there is every reason to believe that it would in like manner have become wild in Europe. The enormous abundance of its remains in the Neolithic pile-dwellings, coupled with the pig-sties, and stores of acorns and beech-nuts found at Robenhausen,

where no other breed of swine has been discovered, seem to me good evidence that it was introduced into Europe as a domestic animal. The small size of its tusks, as compared with the wild boar, was most probably the result of a long domestication before the animal arrived in Europe.

The common domestic hog, descended from the wild boar, may have been originally tamed in Europe, since the wild boar was a member of the European fauna in Pleistocene and Prehistoric times. But, nevertheless, the latter is found also in Asia, and it is therefore very probable that it was domesticated in the same region as the dog and the turf-hog.[1]

The Domestic Oxen, Sheep, and Goats.

Among the two or three races of oxen found in the pile-dwellings, the interest centres more particularly in the small, delicately-shaped Celtic short-horn, which was the sole domestic ox in Britain as late as the English conquest. According to Professor Rütimeyer, it was not originally wild in Europe; while Professor Nilsson, on the other hand, holds that it lived in a wild state in North Germany and Scandinavia. The animal is undoubtedly found in the turbaries of Britain, Ireland, and of the Continent, in association with the remains of animals such as the stag and roe. But this fact tells us nothing of its aboriginal condition, since the cattle introduced into America and Australia have become wild, and are now spreading with a remarkable rapidity

[1] Dr. Rolleston calls attention to the exceeding variability of the wild hogs of Europe, Asia, and Africa, and considers that the Neolithic swine may be of foreign derivation.—*Trans. Lin. Soc.*, SS. i. p. 264.

over the latter continent. Its nearest living analogues in the wild state, at the present time, are some of the smaller oxen of Southern Asia, but it has not as yet been traced, with any certainty, to any one breed of wild cattle.

The second race of cattle, or the *Bos frontosus*, is allied to the Celtic short-horn, according to Nilsson,[1] and, according to Rütimeyer, to the urus. The skull of the animal has been so modified by the development of a frontal protuberance between the horncores, to which the race owes its name, that, in my opinion, it cannot with any certainty be assigned to either. It is probably a mere link in the series by which the one graduates into the other, and may be the result of a cross between the two. What careful selection will effect in modifying the cranial characters may be gathered from the fact that the polled Galloway cattle[2] have lost their horns and acquired a frontal protuberance within so short a time as eighty years. From the small development of the horncores, it is probably more closely allied to the Celtic short-horn than to the urus.

The third or large domestic ox (*Bos taurus*) may have been derived from the wild urus which inhabited Europe in the Pleistocene and Prehistoric ages, and as late as the sixteenth century after Christ.[3] Nevertheless, from its appearing in the domestic state along with non-European animals, it is probable that it was introduced as a breed already in the service of man. According to

[1] Nilsson "On the Extinct and Existing Bovine Animals of Scandinavia," *An. and Mag. Nat. Hist.*, 2d ser. iv. (1849).

[2] Letter of the Earl of Selkirk, published in *Quart. Journ. Geol. Soc. Lond.* xxiii. p. 177.

[3] Dawkins, *Quart. Journ. Geol. Soc. Lond.* xxii. 391.

Professor Nilsson, it was imported into Scandinavia from Southern Europe. The same remarks apply equally to the probable ancestry of the domestic horse.[1]

The sheep of the pile-dwellings was horned, and of a fine delicate breed, and the goat possessed keeled horns arching backwards, nearly in one plane, and was probably the ancestor of the Welsh goat. Neither of these animals is represented by any wild stock in Europe, and both were unknown in the Pleistocene age. It is therefore clear that we must seek their ancestry in some other quarter of the world.

The remains of most of these domestic animals are found in association with Neolithic implements, not merely in Britain and Switzerland, but in Italy, Spain, France, Germany, and Scandinavia, and imply that the same breeds were kept by the herdsmen of that remote age over the greater part of the Continent. It is, however, interesting to note that the local varieties presented now by our domestic breeds, and produced by long-continued selection, have not been observed, up to this time, in Neolithic Europe.

It is a remarkable fact that the domestic animals appear to have been introduced into Europe *en masse*, and not, as they might have been expected, one after another. The dog probably was the first servant of man, and aided him in hunting; but the association of the remains of the animals in Europe affords no direct evidence on the point.

[1] Professor Rütimeyer adds the ass to the domestic animals found in the Neolithic pile-dwellings of Wauwyl, and that of Auvernier, of late Bronze age. Keller, *Lake-dwellings*, pp. 543, 545.

Animals probably derived from Central Asia.

From this outline it is clear the domestic[1] animals were not domesticated in Europe, but that they had already been under the care of man probably for long ages in some other region. The turf-hog, the Celtic short-horn, the sheep, and the goat, must have been domesticated in the countries in which their wild ancestors were captured by the hunter in Central Asia. To this region also belong the jackal, the wild boar, and the wild horse, and in ancient times the urus. It is therefore probable that all these domestic animals came into Europe with their masters from the south-east,—from the Central Plateau of Asia, the ancient home of all the present European peoples.

This conclusion is confirmed by an examination of the Neolithic cultivated seeds and fruits.

The Cultivated Seeds and Fruits.

The seeds and fruits, cultivated by the Neolithic inhabitants of the Swiss pile-dwellings, give us most important information as to the arts of agriculture and gardening in the Neolithic age. In the fields, as Pro-

[1] I am not aware of any well-authenticated case of the discovery of any of the domestic animals in any part of Europe in any deposits older than the Prehistoric age; and I find, on consulting Professors Gaudry and Rütimeyer, and Drs. Virchow and Forsyth Major, that they also have not met with the domestic animals in the undisturbed Pleistocene strata of their respective countries. The remains of the domestic animals, however, are frequently found in caverns brought into association with Pleistocene species, either by the hand of man, or by the burrowing of rats, rabbits, badgers, or foxes.

fessor Heer[1] has shown, there were no less than eight kinds of cereals.

Small lake-dwelling wheat (*Triticum vulgare antiquorum*, Heer).
Egyptian wheat (*T. turgidum*, L.)
Two-rowed wheat (*T. dicoccum*, Schr.)
One-rowed wheat (*T. monococcum*, L.)
Compact six-rowed barley (*Hordeum hexastichum densum*, Heer).
Small six-rowed barley (*H. sanctum*, Heer).
Common millet (*Panicum miliaceum*, L.)
Italian setaria (*Setaria Italica*, L.)

Of these the first, peculiar from its small ear and small grain, was the most common: it lasted down to the Roman conquest of Switzerland, and then became extinct. The Egyptian wheat does not agree exactly with any existing variety, and was rarely grown. The two-rowed kind differs from all known varieties, while the one-rowed is only known in the Neolithic age by the presence of a single ear. The small six-rowed barley is probably the original form from which the common four-rowed barley has descended; the axes of the ears having become longer by cultivation through many ages, and the spikelets having been pushed farther asunder by the greater development of the grain.

Several of our most familiar seeds and fruits grew in the Neolithic gardens and orchards. All, however, were smaller than those now under cultivation, as well as nearer to the wild forms from which they descended. They were—

Peas (*Pisum sativum*, L.)
Poppies (*Papaver somniferum antiquum*, Heer).
Flax (*Linum angustifolium*, Hudson).

[1] *Die Pflanzen der Pfahlbauten.* Keller, *op. cit.* p. 518 *et seq.*, gives a valuable abstract of Dr. Heer's treatise.

Caraway seeds (*Carum carui*).
Apples (*Pyrus malus*, L.)
Pears (*Pyrus communis*, L.)
Bullace plums (*Prunus institia*, L.)

The cereals are of Mediterranean habit, and have been used by the Egyptians, Greeks, and Romans from the earliest times. Two weeds also which grew in the cornfields, the common blue corn-bottle (*Centaurea cyanus*, L.) and the Cretan catchfly (*Silene cretica*), are indigenous in Asia Minor, Greece, and Italy. The small-leaved flax is also a native of Southern Europe.

It is remarkable that the seeds of the wild plants found in the lake-dwellings are absolutely identical with those of the present time; while the seeds of the plants under cultivation have been improved by the care of man in the many centuries which separate the Neolithic age from our own times.

It is therefore evident that in the fields, gardens, and orchards the pile-dwellers possessed vegetables not traceable to wild stocks now growing in Switzerland; and it is certain, from the researches of Professor Heer, that the foreign stocks have been derived from Southern Europe or from Asia Minor. They show that agriculture was probably first invented in the warmer regions of the south and east, and that the knowledge of it was afterwards introduced into northern, western, and central Europe.

The Shell-Mounds of Denmark.

The discoveries made in the refuse-heaps of Denmark by Prof. Steenstrup, and others,[1] reveal to us a state of

[1] Steenstrup, *Sur les Kjokkenmoddings de l'Age de la Pierre*, Congres. Int. Archéol. Préhist. Copenhague, 1869. Lubbock, *Prehistoric Times*

culture on the shores of the Baltic far below the general level of that of Switzerland and Europe in the Neolithic age. Vast accumulations of shells and bones of fishes, birds, and animals, close to the sea-shore mark the sites of ancient encampments, which were occupied during at least two-thirds of the year, and were no mere resting-places for nomad hunters. Oysters, cockles, mussels, and periwinkles formed the principal shell-fish which were eaten; and the herring, cod, dorse, eel, and flounder, the principal fishes. The shell-fish, Sir Charles Lyell remarks, are of the usual dimensions to which they arrive in the open sea, and not stunted as they are now in the Baltic; from which it may be inferred that the Baltic was more closely connected with the ocean than at present, and not so brackish at the time of these accumulations as it is now. The cod and the herring also are deep-sea fishes, and are not likely to have been caught without the use of coracles or canoes.

Among the birds, the great auk (*Alca impennis*), now extinct in Europe, and fast becoming exterminated in Greenland, is the most abundantly represented in the refuse-heaps. There are also wild ducks, geese, wild swans, and capercailzies. The last of these feeds principally on the buds of the pines, and consequently it may be inferred from its presence that at this time the country was covered with dense forests of pine, or the earliest of the three great forest-growths which are shown by the discoveries in the peat-bogs to have occurred in the following order:—

4 ed. c. vii. Lyell, *Antiquity of Man*, 4th ed. p. 12. Worsaae, *La Colonisation de la Russie et du Nord Scandinave.* Mém. Soc. Roy. des Antiq. du Nord, 1873-4; transl. par E. Beauvois, 1875. Copenhague.

1. Scotch firs.
2. Oaks.
3. Beeches.

respectively associated with articles of the Neolithic, Bronze, and Iron ages. The most common mammals are the stag, roe, and wild boar, but there are also

The beaver.	Otter.
Water-rat.	Bear.
Urus.	Seal.
Lynx.	Porpoise.
Wild cat.	Hedgehog.
Wolf.	Dog.
Fox.	

This assemblage of animals, all wild, with the exception of the last, tells us that here we have to deal with man as a hunter, fowler, and fisherman; not as a farmer, or herdsman, but as master only of that domestic animal which would be useful to him under those conditions of life. The dog, it must be remarked, not only picked, as Prof. Steenstrup has shown, the bones left by the hunter, but at times was himself used for food.

Are we to consider these remains as marking a stage in the history of mankind before the introduction of flocks and herds, and of agriculture, or, in other words, before the appearance of the Neolithic civilisation as it has been defined above? Prof. Worsaae holds that they must be so viewed, while Prof. Steenstrup brings forward evidence to connect them with the Neolithic tumuli which abound in the district. The latter argues that, although the implements in the refuse-heap are, on the whole, exceedingly rude, the flakes are admirably made, that polished stone axes occur, and that some of the implements have been made out of polished

stone axes. He therefore believes that if they do not belong to the age of the Neolithic tumuli, they must be of a later and not an earlier age. On weighing both sides of the question it seems to me very probable that the refuse-heaps were accumulated by a section of the same people who raised the tumuli over their dead; and that they found it advantageous to live by hunting and fishing in a region teeming with game of various kinds; or that they were compelled to forsake their domestic animals except the dog, and to take refuge in the gloomy pine forests on the shores of the Baltic, under the pressure of invasion. The remains do not appear to me to mark a phase preceding the Neolithic culture in northern Europe.

The Neolithic Art.

Although the Neolithic men were immeasurably above the Cave-men in culture, they were far below them in the arts of design. They have not left behind any well-defined representations of the forms either of plants or animals. Their engravings consist of the hollows, or cup-stones, on the slabs composing the stone chambers of their tombs, of spirals and concentric circles; and their highest artistic achievement is the rude figure of a stone axe in its handle of wood, engraved (Fig. 109) on the roof of the sepulchral chamber of Dol-ar-Marchnant, near Locmariaker in Brittany.[1] A group of axes is also

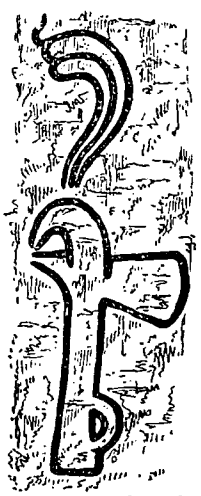


FIG. 109. — Plumed Hatchet on roof of Dol-ar-Marchnant.

[1] See Fergusson's *Rude Stone Monuments in all Countries.* Ireland, pp. 206-220. Brittany, 8vo,

represented on a slab in the neighbouring tomb of Manné-er-h'Roek.[1] The peculiar upward curvature of the handle in these figures is precisely of the same kind as that presented by the wooden handle of the axe obtained by Mr. R. D. Darbishire from Ehenside Tarn,[2] Cumberland. These engravings prove that the implement, which is to us a symbol of the Neolithic civilisation, was highly prized by its owners. It alone has been drawn sufficiently well to be recognised by modern anthropologists.

Neolithic Civilisation derived from Central Asia.

The origin of the domestic animals, as well as of the cereals, proves that the Neolithic peoples migrated into Europe from the south-east, from the mysterious birthplace of successive races, the Eden of mankind, Central Asia. They probably came by the same routes as those pursued by subsequent migrations, one branch going by way of Asia Minor and Greece, and passing through Italy into Spain; and another traversing the region of the Don and the Volga and the great plains of the Danube, and thence, undeterred by any natural obstacle, penetrating to the borders of the ocean. They must have occupied the Continent for a long period before their arrival in this country, and Britain must have been colonised long before Ireland, since the barrier of sea, which kept the Romans out of the latter island,

pp. 361-365. Mr. Fergusson considers all these to be of comparatively modern origin. Some are later than the Neolithic age, but those mentioned in the text appear to me to be undoubtedly Neolithic.

[1] Galles, *Rapport à la Société Polymathique du Morbihan.* Le 25 Nov. 1863.

[2] *Archæologia*, xliv. pp. 273-292.

would be a more serious obstacle to the canoes made out of the trunk of a big tree than to a Roman fleet. The south-eastern derivation of the Neolithic peoples will go far to explain the sharp line of demarcation between them and their predecessors the Cave-men, who retreated before them farther to the north and to the north-east.

General Conclusions.

The Neolithic implements, and the domestic animals and plants, described in the preceding pages, have been discovered over the whole of Europe with the exception of northern Russia and northern Scandinavia. They imply that the Neolithic civilisation was long established, and that it underwent so little change, if any, in the lapse of ages that no traces of a change have been preserved to our times. Its duration varied in different countries, and it yielded place to a higher culture in Greece and Italy long before it passed away from central and northern Europe. Glass beads brought from the Mediterranean, and probably of Phœnician work, occur in the Neolithic tombs of France, and in the pile-dwellings of Switzerland. There is every reason to believe that Egypt and Assyria were highly organised empires, and that the Mediterranean peoples were far advanced in the path of civilisation, while the Neolithic phase held its ground in France and Germany, in Britain and in Scandinavia.

The introduction of this civilisation is the starting-point of the history of the present inhabitants of Europe. To the Neolithic peoples we owe the rudiments of the culture which we ourselves enjoy. The arts which they introduced have never been forgotten, and all subsequent

progress has been built upon their foundation. Their cereals are still cultivated by the farmer, their domestic animals still minister to us, and the arts of which they only possessed the rudiments, have developed into the industries—spinning, weaving, pottery-making, mining; without which we can scarcely realise what our lives would be.

CHAPTER IX.

THE NEOLITHIC INHABITANTS OF BRITAIN OF IBERIAN RACE.

Physique.—Range over British Isles.—Range on the Continent.—Identification with the Iberian Race.—Celtic Invasion of Gaul and Spain in the Neolithic Age.—Historic Evidence as to Iberic and Celtic Races in Spain and Gaul.—The Iberic Race in Retreat.—The Iberic Race the Older.—Historic Evidence as to Iberic and Celtic Races in Britain.—Relation of Iberians to Ligures and Etruskans.—Iberic Element in the Present Population of Spain.—Iberic, Celtic, and other Elements in the Population of France.—Iberic Element in the British Isles.—The Witness of Language.—Traces of Neolithic Culture in Basque Dialects.—Survivals from the Neolithic Age.—Neolithic Superstitions still current in Europe.—General Conclusions.

WE have now to discuss the difficult questions as to the relation of the Neolithic inhabitants of Britain to those of the Continent, as well as to races of men still living in the same area. Are they now banished from Europe in the same manner as the Cave-men, or are they still represented in the present population? These problems may be solved by combining the results of osteological enquiry with those of ethnology, history, and geography.

Physique of Neolithic Population in Britain and Ireland.

The researches of Thurnam and Davis, Wilson,

Huxley, Busk,[1] and others into the physique of the people described in the last chapter, who buried their dead in the tombs, and whose skeletons are met with in the alluvia and peat-mosses, reveal the important fact that the population of the British Isles was uniform in character through the whole of the Neolithic age. They were small in stature, averaging five feet five inches in height, according to Dr. Thurnam. The stature of the dead buried in the sepulchral caves of Perthi Chwareu, and in the chambered tomb at Cefn, is estimated by Prof. Busk at a maximum of five feet six inches and at a minimum of four feet ten inches.[2] Their skulls are of fair average capacity, and are of the long or oval type[3] (Fig. 110), the length being due to a develop-

[1] Thurnam, *Mem. Anthrop. Soc.*, vols. i. and iii. Thurnam and Davis, *Crania Britannica.* Wilson, *Prehistoric Man*, and *Prehistoric Annals of Scotland.* Laing and Huxley, *Prehistoric Remains of Caithness.* Busk, *Journ. Ethnol. Soc. Lond.*, 2d ser. ii.

[2] The stature of the people buried in the long barrow of Nether Swell, Gloucestershire, is estimated by Prof. Rolleston at 5 feet 5 inches for the men and 4 feet 9 to 10 inches for the women. *Journ. Anthrop. Inst.* v. p. 21.

[3] Human skulls are classified, according to Dr. Thurnam and Prof. Huxley, as follows—the basis of classification being the "cephalic index," or the ratio of the extreme transverse to the extreme longitudinal diameter of the skull, the latter measurement being taken as unity (Huxley) :—

I. Dolichocephali, or long skulls, with cephalic index at or below	·70
Subdolichocephali	from ·70 to ·73
II. Orthocephali, or oval skulls	·74 to ·77
Subbrachycephali	·77 to ·79
III. Brachycephali or broad skulls	at or above ·80

It has been argued from the diversity in the forms of the skulls observable at the present time among people living under artificial conditions, such as ourselves, that it is impossible to tell a man's race by the shape of his skull. To some extent this is true of our highly organised communities in Europe and America, where people of different nations and

ment of the back of the head, termed by Dr. Broca "dolichocephalie occipitale," as distinguished from the "dolichocephalie frontale" of other races. The outline of the face was oval, the supraciliary ridges being less strongly marked, and the cheek-bones much less developed than in the round skulls, the upper and lower jaws small, and the lower part of the face not projecting beyond a vertical line dropped from the forehead (ortho-

races are continually coming into contact, and where life is removed farthest from its natural and simple surroundings. But it does not apply to people living under the conditions of those described in this chapter, nor does it apply to simple communities at the present time. The same habits of life, common to a tribe or a race of rude civilisation, coupled with comparative purity of blood, certainly produced a greater uniformity in the shape of the head, than that which we observe among ourselves. It seems, therefore, to me little less than idle to say that the unity of type running through the whole of these Neolithic skulls is of no significance, because in certain hatters' shops in Manchester, London, or Vienna, the outline of the heads is so variable. In these cases the difference is brought about by abnormal conditions of life, and the mixture of different races through commerce.

For practical purposes it is much more convenient to treat the long and oval skulls under the same heading. As an example of it we may take the description of the skull from the primary interment in the barrow of Winterbourne Stoke, described by Dr. Thurnam (*Mem. Anthrop. Soc.* i. 44) as follows:—"The greatest length is 7·3 inches (the glabello-inial diameter 7·1 inches), the greatest breadth is 5·5 inches, being in the proportion of 75 to the length taken as 100. The forehead is narrow and receding, and moderately high in the coronal region, behind which is a trace of transverse depression. The parietal tubers are somewhat full, and add materially to the breadth of this otherwise narrow skull. The posterior borders of the parietals are prolonged backwards, to join a complex chain of Wormian bones in the line of the lambdoid suture. The superior scale of the occiput is full, rounded, and prominent; the inion more pronounced than usual in this class of dolichocephalic skulls. The superciliaries are well marked, the orbits rather small and long, the nasals prominent, the facial bones short and small, the molars flat and almost vertical, the alveolars short but rather projecting. The mandible is comparatively small but angular, the chin square, narrow, and prominent."

gnathic). The nose was aquiline, and the forehead low as compared with that of the round skulls (Fig. 111) to be described presently. Skulls possessed of these characters have been described by Huxley and Wilson from many places in Scotland, and they occur in Neolithic tombs in England, Wales, and Ireland, under circumstances which render it impossible to doubt that the whole of the British Isles was inhabited from the beginning to the close of the Neolithic age by the same small race in the same stage of culture. In Scotland it is identical with the people possessed of (kumbecephalic) boat-shaped skulls of Prof. Wilson,[1] and in Ireland by those from chambered tombs, peat-mosses, and river-deposits, described by Prof. Huxley as belonging to the river-bed type, and by Dr. Thurnam to that of the "long bar-

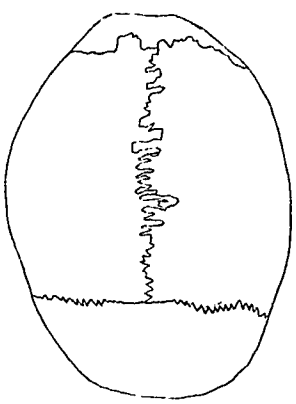


FIG. 110.—Long Skull of Neolithic Age, Long Barrow, Rodmarton.

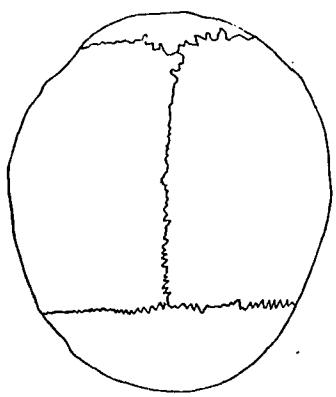


FIG. 111.—Broad Skull of Bronze Age, Round Barrow, Gristhorpe.

rows." In Figures 110, 111, we have given outlines of the two typical forms of skull, the long being obtained from the chambered tomb at Rodmarton, and the broad

[1] *Prehistoric Annals of Scotland*, 2d edit. vol. i. c. ix.

from the interment of the Bronze age at Gristhorpe, Yorkshire.[1]

Prof. Busk has noticed that some of the leg bones present peculiar characters, the thigh bone bearing an enormously developed *linea aspera*, and the tibia being flattened laterally, sometimes to the extent of presenting a section similar to that of the blade of a sabre.[2] The latter character is not, as it is sometimes considered, a character linking man with the apes, but is probably related to the free use of the muscles of the feet uncontrolled by rigid sole or sandal. In the large collections of skeletons which I obtained from the sepulchral caves, and the caves of Perthi Chwarcu, Rhos-Digre, and the chambered tomb near Cefn, this peculiar character was only met with in some of the older bones, and was absent in most of the men, and all the boys, women, and children. The same irregularity applies equally to the large collection of skeletons of Red Indians from the burial mounds preserved in the Peabody Museum at Cambridge, Mass., which I was allowed to examine by the kindness of Prof. Putnam in 1875. The flattened tibia has been observed among negroes, and it is not unknown even among civilised Europeans. It cannot therefore be taken to be a character distinctive of race, but one dependent upon the use, more or less, of certain muscles.

Range on the Continent: Belgium, France, and Spain.

These small men are proved by numerous discoveries to have had a wide range on the Continent in the

[1] For figures and descriptions see Thurnam, *Mem. Anthrop. Soc. Lond.* i. pp. 152-153.

[2] For details, see *Cave-hunting*, c. v. vi.

Neolithic age. They have left traces of their presence in numerous interments in chambered tombs and caves in Belgium and in France,[1] as well as in Spain and in Gibraltar.[2] We may therefore conclude that at one period in the Neolithic age the population of Europe, west of the Rhine and north of the Alps, was uniform in physique, and consisted of the same small people as the Neolithic inhabitants of Britain and Ireland.

The researches of Dr. Virchow also prove that skulls of the same type occur in the peat bogs of north Germany and of Denmark, bearing a closer resemblance to those of the Basques than to those of any other race.[3]

Identification with Iberian Race.

The next point to be considered is their relation to the present inhabitants of Europe. Have they been exterminated in the struggles which have taken place during repeated invasions, or are they still represented in the present population? The labours of Thurnam, Busk, Virchow, Huxley, Wilson, and others, combined with the observations of Dr. Broca,[4] offer most conclusive evidence that they are still to be numbered among the living races of Europe.[5]

The numerous skulls obtained from Basque cemeteries possess exactly those characters which have been remarked above in the Neolithic tombs and caves in

1 For details, see *Cave-hunting*, c. vi.

2 *Intern. Congr. Prehist. Archeol. Norwich*, vol. 1869, p. 106.

3 *Matériaux*, 1870, p. 340.

4 Broca, *Anthrop. Mém. Paris*, i. p. 1, iii. p. 147.

5 For details, see *Cave-hunting*, c. vi., and an Essay in *Fortnightly Review*, Sept. 1874, p. 323.

Britain and on the Continent, and may therefore be taken to imply that the Basque-speaking peoples are to be looked upon as a fragment of the race which occupied the British Isles, and the area west of the Rhine and north of the Alps, in the Neolithic age.

The Basques of the present day are, as might be expected from the many invasions they have undergone, by no means uniform; but the researches of Dr. Broca prove that the real Basque stock was small in stature, dark in complexion, with black hair and eyes, and with a long head; the other elements in the population, as at present constituted, having been contributed by the Celtic, and long afterwards by the Gothic and English invaders. Nor can there be any reasonable doubt as to this small, dark-haired people being identical with the ancient Iberians of history,[1] who have left their name in the Iberian peninsula as a mark of their former dominion in the west. Thus, by a chain of reasoning purely zoological, we arrive at the important conclusion that the Neolithic inhabitants of the British Isles belong to the same non-Aryan section of mankind as the Basques, and that in ancient times they were spread through Spain as far to the south as the Pillars of Hercules, and as far to the north-east as Germany and Denmark.

The Celtic Invasion of Gaul and Spain in the Neolithic Age.

The Iberic population of the British Isles was apparently preserved from contact with other races

[1] Broca, *Sur l'Origine et la Repartition de la Langue Basque*, Rev. Anthrop., 1875.

throughout the whole of the Neolithic age. On the Continent, however, it is not so; a new set of men, differing in physical characteristics from them, make their appearance. They were bigger than the preceding, averaging, for the adult male, 5 feet 8·4 inches in height, according to Dr. Thurnam. The skulls (Fig. 111) are broad, or round (brachycephalic), the supra-occipital tuberosity or "probole" prominent, the parieto-occipital region often flattened, the supraciliary ridges more strongly marked than in the oval skulls. The face instead of being oval is angular, or lozenge-shaped, and the upper and lower jaws are so largely developed, and projected so far beyond the vertical line dropped from the forehead, that the term macrognathic has been happily applied to them by Prof. Huxley; their foreheads are high, broad, and expanded. Human remains of this kind are met with in caves and tombs in Belgium, France, and Spain,[1] under conditions which show that the tall race occupied those regions in the Neolithic age, and the occurrence of the two forms of skull, with all the intermediate varieties, in chambered tombs and sepulchral caves reveals the fact that the tall invader and the small dark inhabitant of France dwelt side by side in the same area. The new invader is identified by Thurnam and Huxley with the Celtæ of history, whose tall stature, light hair, and fierce blue eyes, have been handed down as their principal characters. The Belgæ also were tall and fair, but their exact relation to the Celtic and Germanic or Teutonic tribes is uncertain.

[1] For details, see Thurnam and Davis, *Crania Britannica*. Thurnam, *Anthrop. Mem. Soc. Lond.* I. and III.; Rolleston, in Greenwell and Rolleston's *Ancient British Barrows*.

Historical Evidence of Iberic and Celtic Races in Spain and Gaul.

These two races were in possession of Spain during the very earliest times recorded in history, the Iberians occupying the north-western region (see Map, Fig. 112), and the Celts, or Gauls, extending in a broad band south of the Pyrenees along the Mediterranean shore; according to Ephorus and Eratosthenes, as far as Cadiz or Gadeira (*μέχρι Γαδείρων*), and forming isolated settlements also in Portugal. When they are first brought before us, they had already been dwelling side by side long enough to form, by their union, the powerful nation of Celt-Iberi of Castile, defining the pure Iberian on the west from the pure Celt on the east. The former predominated over the latter to such an extent as to give their name to the whole peninsula, although they were no longer masters of the district best known to the Phœnicians and ancient Greeks on the side of the Mediterranean. Here the Ligurians are to be counted among the inhabitants, if the statements of Thucydides be true, that they expelled the Sikanoi from the district of the river Sikanos. In the north the Vascones then, as now, held the Basque provinces of Spain.

The distribution of these two races in Gaul is similar to that which we have noted in Spain. Iberia was believed by the ancient Greeks to have extended before their time beyond the Pyrenees, as far to the north-east as the Rhone;[1] and Scyllax remarks incidentally that the Ligurians and mixed Iberians (*Ἴβηρες μίγαδες*), dwelt on the shores of the Mediterranean, from the mouth of the above river as far as Emporium in Spain. To the

[1] Strabo, iii. 166.

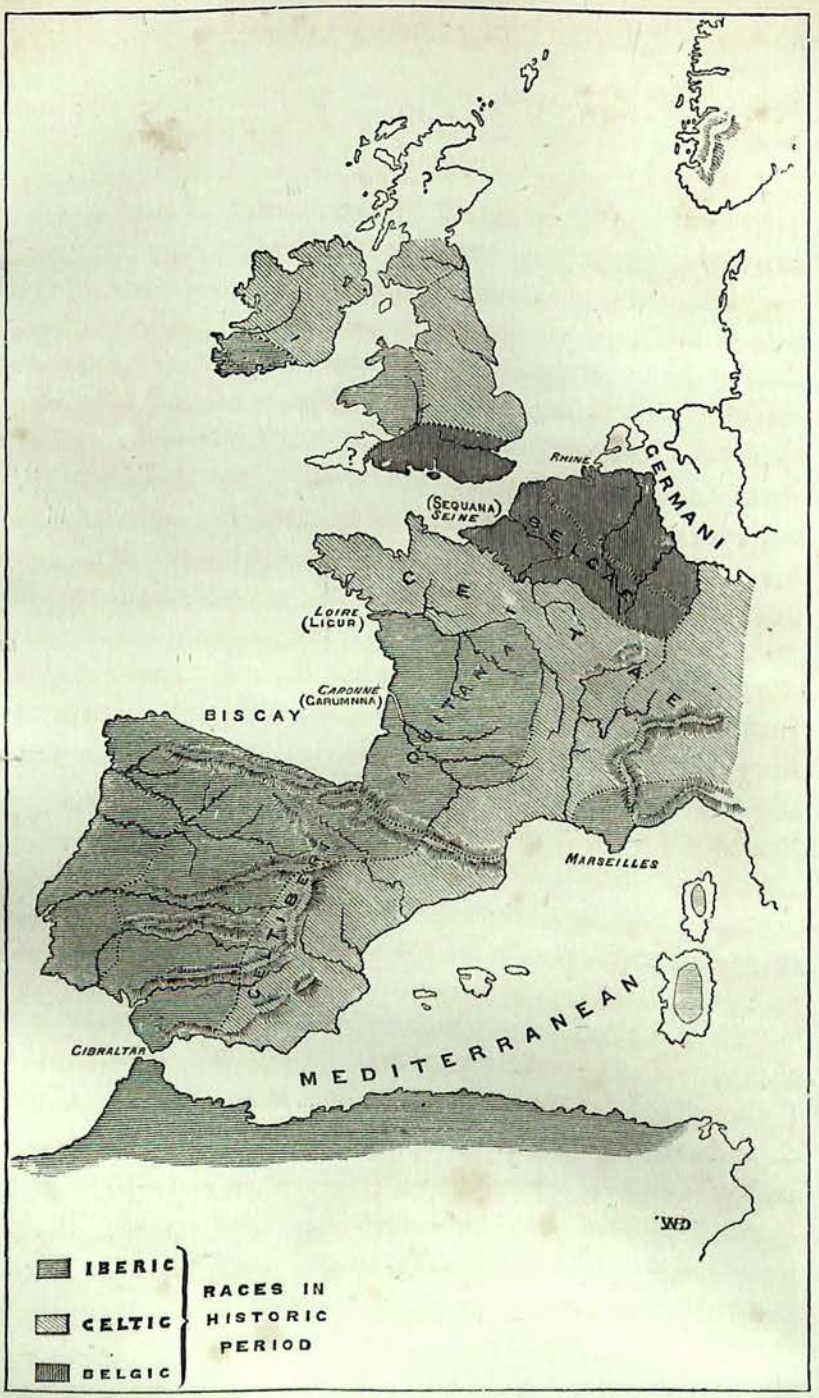


FIG. 112.—Iberic and Celtic Peoples in Europe in Historic Period.

north-west it extended as far as the ocean, but its northern frontier is undefined, as might be expected from the imperfect sources of accurate geographical knowledge possessed by the Greeks. The rich mines of copper, tin, and lead, might have tempted the adventurers of those days to penetrate into the western Pyrenees; or sailors returning from the amber coast of the Baltic, or the tin-producing districts of Brittany or of Cornwall, may have brought back news of the Iberic tribes on the coast of Aquitaine; but the region to the south-west of the great trade route from the Phocæan colony of Marseilles, through Celtic Gaul to Britain, inhabited by warring tribes, is not likely to have been well known to the ancient geographers. Their varying statements as to the northern frontier are justly interpreted by Dr. William Smith "to express the fact in ethnography that the Iberian race extended beyond the boundaries of Spain, and that they were to a great extent intermingled with the Celts in western Europe."[1] In the time of Strabo the Pyrenees formed the northern boundary of Iberia.

When Cæsar conquered Gaul, the Iberian Aquitani possessed the region bounded by the river Garonne, the Cevennes, and the Pyrenees. The subsequent addition by Augustus to Aquitania of the fourteen tribes inhabiting the district between the Garonne and the Loire, was probably due to the fact that their manners and customs were more akin to the Aquitani than to the Celtæ, and that therefore they were more easily governed from the same centre as the former, than from that of the latter. They are considered by Dr. Broca, on ethnological grounds, to be a mixed race, like

[1] *Dictionary of Greek and Roman Geography*, i. 1078; Article "Hispania."

the Celt-Iberi of Spain. An ethnological connection also between Aquitaine and Brittany (Armorica), may be inferred from the remark of Pliny, "Aquitania Armorica ante dicta;"[1] considered an unaccountable blunder by Dr. Latham. The truth of Pliny's statement, however, is confirmed by Dr. Broca's map of the stature and complexion of the peoples of France, to be examined presently (Fig. 113). The Celts occupied the region from the Loire to the Seine, ranging as far to the east as Switzerland, and they were masters of the country extending from the frontiers of Aquitaine into the valley of the Rhone, being conterminous with the Celts of Spain. Thus the south-western districts of France and Spain were occupied by an Iberian population, represented now by the small dark Basques, while the Celtic peoples inhabited the region extending from the valley of the Seine, through central France, into the valley of the Rhone, and over the Eastern Pyrenees, into southern Spain.

The Iberic Race in Retreat.

This westward retrocession of the frontier of Iberia, from the Rhone to the Pyrenees, is a most important historical fact. It shows that before the days of Strabo the Iberic peoples were retreating under the pressure of invaders from the east. At the dawn of history they held a position in Europe far more important than in later times, but far less important than that which they occupied in the Neolithic age, when they have been proved, by the discoveries in sepulchral caves and tombs, to have lived as far to the north-east as the Rhine. In

[1] iv. 17.

this respect, then, the historical narrative agrees with the conclusions at which we have arrived from the distribution of the human remains over the Continent. The relative antiquity also of the two races in Europe is settled. The Iberians were the possessors of the land from which they were ultimately driven by the invasion of the Celtic peoples farther and farther to the south-west into those fastnesses in which they were compelled to make a stand by the waters of the ocean.

Iberic Race the Older.

This invasion of the regions west of the Rhine took place, as we have seen, in the Neolithic age, and long before the dawn of history in those regions. In the days of Cæsar the Belgæ possessed the country from the Seine and Marne as far north as the Scheldt, and pressed upon the Celtæ, with whom they were probably closely related in language and physique. They were in their turn pushed to the west by the advance of the Germans in the Rhine provinces. Thus we have the oldest population, or the Iberian, in the western parts of France and Spain, being pushed farther and farther westward by the Celts; the Celts in their turn by the Belgæ; and these again by the Germanic tribes. The Neolithic aborigines are in the west; and the relative positions (Fig. 112) of the three peoples mark their relative antiquity in Europe.

Historic Evidence as to Iberic and Celtic Peoples in Britain.

An appeal to the ancient history of Britain reveals the same elements in the population in the same relative

positions as in Gaul. Just as the Celts pushed back the Iberian population of Gaul as far south as Aquitania, and swept round it into Spain, so they crossed the Channel and overran the greater portion of Britain, until the Silures,[1] identified by Tacitus with the Iberians, were left only in those fastnesses which were subsequently a refuge for the Welsh against the English invaders. And just as the Belgæ pressed on the rear of the Celts as far as the Seine, so they followed them ultimately into Britain, and took possession of the Pars Maritima[2] or southern counties. The unsettled condition of the country at the time of Cæsar's invasion was due to the struggle then going on. The Iberian population by that time had been driven as far as they could go to the west, not only in Spain and in Gaul, but also in Britain, and were restricted to those areas in which the ethnologist can trace their blood in the present population. Since that time, however, they must have been profoundly affected by the invasions of the various Germanic tribes, who settled in their land, and forced back upon them the Celtic and Belgic peoples, ever pressing them to the west.

Relation of Iberians to Ligurians and Etruskans.

Before the Celtic invasion Gaul was inhabited by other tribes than the Iberian. The Ligures dwelt in the district round Marseilles, and held the region between the river Po and the Gulf of Genoa to the western boundary of Etruria, and they extended along the coast of the Mediterranean as far as the Pyrenees, that is to say, over the area included under the name of Iberia in

[1] Agricola, xi.

[2] Cæsar, i. xii.

its more ancient sense. They have also left marks of their presence in the name of the Loire (Ligur), and possibly in Britain in the obscure term Lloegrians (Lloegr). From the intimate manner in which they are associated with the Iberians by classical writers, coupled with their agreement in small stature and swarthy complexion, it may be inferred with tolerable certainty that they were related to each other, as the Frank to the Goth, or the Dane to the Norman, and that they belong to the same non-Aryan branch of the human race. It is also by no means improbable that the small swarthy Etruskans, whose empire extended in the earliest times recorded by history north of the Alps into Tyrol, and who held dominion also over Lombardy, belong to the same non-Aryan stock, since they were conterminous, and were driven away from their ancient possessions by the same invading peoples. Just as the Celt poured down through central France, isolating the Ligurian and the Iberian, so he poured through the passes of the Alps into Lombardy, sundering the Etruskans of Rhætia and Noricum from those of Etruria proper. In my belief the Iberians of France and Spain, the Silures of Wales, the Ligures of southern Gaul and northern Italy, and the small dark Etruskans, are to be looked upon as ethnological islands isolated by successive invasions, pointing out that if we could go deep enough in past time we should find that the whole of Europe was inhabited solely by a swarthy non-Aryan population.

The Iberic Element in the present Population of Spain.

The physical characters of the races defined in the preceding pages are still possessed by the present inhabit-

ants of Spain, France, and Britain. The Iberic element in the population of Spain has mainly contributed to the long-headedness of the modern Spaniard, although that character may be partially derived from Gothic and Moorish invaders. The Basques on the north-west, protected from attack by their inaccessible country, have preserved the race-characters, as might be expected, in their greatest purity.[1] With regard to the rest of the peninsula, sufficiently accurate observations have not yet been made to justify any conclusions as to the exact areas now occupied by the descendants of Iberian aborigines and Celtic invaders. The problem is rendered almost hopeless from the great changes which must have resulted from the conquest of the Goths and Moors, for if the former contributed their fair or "xanthochroic" characters to the modern Spaniard, it is no less certain that the latter have equally handed down to him their dark complexions and lithe active forms. I do not know that any important physical difference has been observed between the Moor and the Iberian; and it is very probable that the two are closely allied together, and connected with the Berbers of northern Africa, considered by Professor Busk to belong to the same stock as the Iberians.

Iberic, Celtic, and other Elements in the Population of France.

We are able to form an accurate idea of the origin, both of the complexion and stature, of the present inhabitants of France, from the labours of Dr. Broca,[2] to

[1] Broca, *Sur l'Origine et la Repartition de la Langue Basque.* Rev. Anthrop. 1875.

[2] *Mém. Soc. Anthrop. de Paris*, i. p. 1, iii. p. 224. The accuracy of

whom we are indebted for admirable maps, based on the army returns for each department from 1831 to 1860. These show the number of exemptions per one thousand conscripts on account of their not coming up to the standard of height of 1·56 metres (= 5 feet 1½ inches), and therefore indicate the average stature in each department. The intimate relation of stature to the prevalent complexion may be gathered from the following table of exemption per one thousand, the "départements noirs, gris, et blancs" being occupied respectively by dark peoples with black hair and eyes, people with brown hair and gray or brown eyes, and people with light complexions and eyes;—

Départements noirs	.	75·47	à 174·85
„ gris	.	54·77	à 74·40
„ blancs	.	24·39	à 54·11

From this it is evident that the exemptions are nearly thrice as many in the "départements noirs" as in the "départements blancs," and we may therefore conclude that the swarthy (see Fig. 113) inhabitants of France at the present time are the shortest, and the fair the tallest. The "départements noirs" are mainly centered in the old province of Aquitania of Augustus, in which the jet black eyes and hair and swarthy complexions of the natives strike the eye of the traveller. We may, therefore, conclude that these characters have been handed down by direct descent from the ancient Aquitani or Basques (Aquitani, Auski [Auch], Eusques, Basques, Vascones), with comparatively little change from the infusion of new blood since the time of the Roman

these maps is confirmed by those published by Dr. Boudin, *Mém. Soc. Anthrop. de Paris*, ii. pp. 227 and 231.

conquest of Gaul. In Cæsar's Aquitania, as might be expected from the open and defenceless country, the

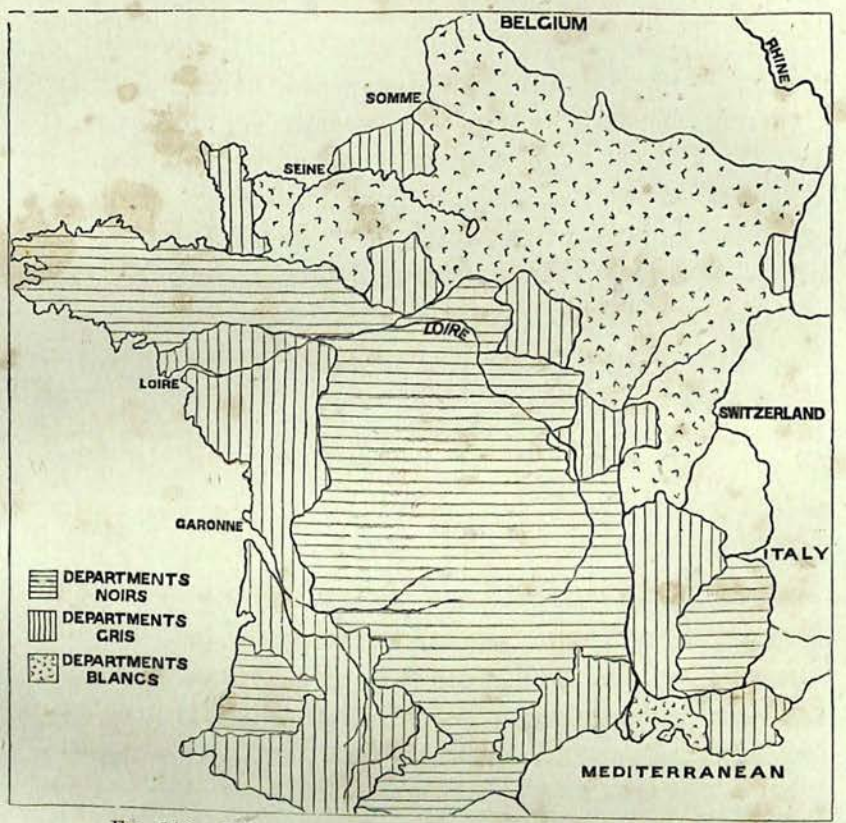


FIG. 113.—Physical Characters of the French People. (Broca.)

maximum change has taken place. Out of the eight departments into which it is now divided, only one (Landes) presents the Basque characters, and these have probably been preserved by the vast stretches of sand which have acted as a barrier against invasion.

The enormous preponderance of Basque characters in the district between the Garonne and Loire is shown in the fact that out of a total of twenty-eight departments

no less than twenty-one come under Dr. Broca's definition of "départements noirs." In this we have the clearest proof that the choice by Augustus of the latter river as the boundary of the province was due to the identity of race of the dwellers south of the Loire with those of the Garonne, which would cause them to be more easily governed from a Basque than from a Celtic centre. (Compare Maps, Figs. 112, 113.) The five departments of Loire Inférieure, Vendée, Maine et Loire, Deux Sèvres, and Charente Inférieure, in which the prevailing population is of moderate stature, with brown hair and gray or brown eyes, lie on the seaboard open to invasion; and the six "départements gris," south of the Garonne, mark the settlements of the fair-haired Visigoths, Franks, and English, who have been masters of that country from the year A.D. 419 to the present day. That the ancient population was to a considerable extent dispossessed is demonstrated by the conditions under which it passed under the Gothic yoke, that two-thirds of the land and one-third of the slaves were to become the property of their conquerors.[1] The departments in question may be said at the present day to be occupied by a Celt-Ibero-Teutonic people, whose physique is intermediate between the vanquished and the victors.

Outside the boundaries of Aquitaine the Iberian blood asserts itself in the swarthy small inhabitants of Brittany —in the east in Ardèche, and in the south in Aude and Arriège. I have already hinted at the probability of a connection between Armorica and Aquitaine from a passage in Pliny which has been quoted, and we have seen that Iberia, in ancient times, extended eastward to the Rhone and westward to the ocean. The Armoricans

[1] Gibbon, *Decline and Fall of the Roman Empire*, iv. 440.

made themselves conspicuous above the rest of the provincials of Celtic Gaul by their coherence, and their obstinacy in confronting the Teutonic invaders. In the midst of the confusion which followed the downfall of the Roman empire they preserved their freedom, and even asserted the dignity of the Roman name, and resisted the attacks of Clovis with such success as ultimately to be admitted to an honourable and equal union.[1] We might, therefore, expect that the ancient population would be represented in greater purity in Brittany than in those districts which were repeatedly harassed by Frank, Goth, or Burgundian. The present dark Bretons are conterminous with the dark inhabitants of Aquitaine, consequently I should feel inclined to hold that the northern frontier of Iberia extended in ancient times so as to embrace that province. It must, however, be remarked that during the conquest of Britain by the English the defeated Britons emigrated in considerable numbers to Brittany, and were themselves, to some extent, of Iberian derivation.

The broadness of skull which predominates in the inhabitants of the "départements noirs et gris" is considered by Dr. Broca to be a character derived from the Celts, along with others not found in the small, dark, typical Spanish Basques.

The ancient Ligurians are represented by the dark small inhabitants of the Hautes and Basses Alps, who are not distinguishable from the rest of the small dark French peoples. A suggestion, therefore, which we have thrown out in the preceding pages, that they may belong to the same stock as the Iberians, founded mainly on

[1] Gibbon, *Decline and Fall of the Roman Empire*, iv. 440.

the geographical relations of the two peoples, is supported by an appeal to their physical characters.

Just as the Iberian element in the French population finds its centre in the Aquitania of Augustus, so is Belgic Gaul the headquarters of the tall, fair-haired element, considered by Dr. Broca and M. William Edwards,[1] the representatives of the ancient Belgæ, whom they identify with the Kymri or Cimbri. It may more probably be referred to the repeated invasions of the north-eastern provinces by tall Germanic peoples, by whom the Belgæ were driven westward, and into the central and southern parts of France. The intermediate zone of Celtic Gaul is occupied partly by fair tall peoples, who may be of Celtic, Belgic, or Teutonic ancestry, but principally by a gray-eyed, brown-haired race, of moderate stature, the natural result of the fusion between the tall fair and the small dark races. This is considered by Dr. Broca to be the result of the union of the Celt with the Iberian, and to constitute the Celtæ of Cæsar as distinguished from the Belgæ.

The physical differences which are evident, when we compare the ancient Celt known to the Greeks and Romans with the present inhabitants of Celtic Gaul, may be explained by the consideration that the hordes who invaded ancient Greece and Italy were on the move, and therefore of comparatively pure race, while the modern Celt is the result of the conquerors dwelling side by side with the conquered, in the same country, for an unknown number of centuries. The use of the terms Ιβηρες μιγαδες, Κελτο-Λιγυρες, Κελτ-Ιβηρες, proves that this fusion of races was going on in the earliest times recorded in Spanish or Gaulish history. Plutarch, in

[1] *Mém. d'Anthropologie*, i. p. 284.

his *Life of Æmilius Paulus* (vi.), speaks of the Ligures in southern Gaul as being mingled with the Gauls, and the Iberians living by the shores of the Mediterranean in southern Gaul.

Iberic Element in British Isles.

The Iberic element in the present population of Britain[1] is traceable in several areas, which offered refuge to the peoples in possession of the country before the invasion of the English. The strong resemblance borne by the small dark Silures to the Iberians was remarked, as we have already noticed, by Tacitus. At the present day his observation applies equally to the small swarthy Welshman, with long head and Iberian physique. The broad-headed dark Welshman is identical with the broad-headed dark Frenchman, and the Welsh people may be defined ethnologically as principally Celtic and Iberian, every intermediate variety between the two extremes being represented. The Silures no longer form a compact ethnological island, but are scattered and dispersed, and mingled with other races, English as well as Celtic.

In Scotland the small dark Highlander,[2] and in Ireland the black Celts to the west of the Shannon, still preserve the Iberian characteristics in more or less

[1] See Huxley, *Journ. Ethnol. Soc. Lond.* II. 4, p. 382, On the Ethnology of Britain.

[2] In these pages I have merely identified two of the elements in the Celtic peoples. There may have been others, but the determining of these must be left for future discovery. The tall, long-headed, dark and red haired men are probably, as Professor Huxley points out, of Scandinavian, and the tall, long-headed, fair men of Low German origin. Both these became intermingled with the older Celtic population of Wales, Ireland, and Scotland, within the Historic period.

purity, crossed with Celtic, Danish, Norse, and English blood (see Fig. 112).

From this outline of the evidence of history and ethnology it will be seen that the Iberic tribes occupied an important position in Europe in ancient times, and are still amply represented in the present population. When we consider the many invasions of strangers, and the oscillations to and fro of different peoples, it is impossible not to realise the strange persistence of the race. Through all the troubles which followed the conquest of Gaul by Cæsar, and of Britain by Claudius, through the terrible events which accompanied the downfall of the Roman Empire, causing the Britons to be exterminated over a large part of England, and the almost total extinction of the ancient type of Roman in Italy, the Iberian lived, and still is found in his ancient seats, with physique scarcely altered, and offering a strong contrast to the fair-haired Celtic, Belgic, and German invaders. The Iberian race is known to the ethnologist and historian merely in fragments, sundered from each other by many invasions and settlements of the Aryan race. It is shown by the researches into caves and tombs to have been in possession of the whole of Europe north and west of the Rhine, in the Neolithic age, and has been traced by Dr. Virchow into Germany and Denmark.

The Witness of Language.

If, as we have seen above, the Iberian race is still represented in Britain, we may naturally inquire whether there be any traces of it offered by the Welsh language. In discussing this question Professor Sayce remarks that "language cannot be the test of race at all, but

only of social contact. We cannot argue from the exceptional phenomena of the stereotyped families of Aryan, Semitic, and Turanian speech. Savage and barbarous dialects are in a constant state of flux and change, while conquest, migration, and other causes, occasion the borrowing of new languages, and the loss of old ones. . . . The Basques, physically and linguistically, are the representatives of a race which preceded the Kelts, and were driven by them into the mountain fastnesses of the extreme West, just as the Finns were by other Aryan tribes in the North. Just as the existence of light-haired persons among the Basques shows only that mixture of blood which was to be expected, so, from the present state of the Basque language, we cannot draw any conclusion against the view that the primitive population with whom the Aryan Kelts came into contact spoke older but cognate dialects. The oldest Basque with which we are acquainted does not date back beyond three or four centuries; before that time there was no literature, and the changes undergone by languages other than literary are astonishingly rapid and extensive. The few native inscriptions of early date found in northern Spain, so far as they can be deciphered, show little resemblance to modern Basque, while Strabo[1] states that not only had the Iberians many different dialects, but several different alphabets as well. This points to want of intercourse, bringing with it a great diversity of language. Numerous as these languages were, however, they must have had a general resemblance to one another, since Strabo (Book iv.) says they were like the idioms of Aquitania, in contradistinction to those of Celtic Gaul. The modern

[1] iii. p. 139.

French Basque dialects are not descended from any of those of Aquitania, since their speakers first entered France after the fall of the Roman Empire, but they would be later descendants of some cognate dialect or dialects. Basque is the sole survivor of what may be called the Iberian family of speech, which was displaced by the Keltic invaders. It is useless to seek for traces of Basque words in local names, whether in France or elsewhere. Basque is too modern to allow us to know the forms of its words even a thousand years ago, while nothing is so soon corrupted as a proper name. Humboldt's attempt to explain local names in Western Europe by means of modern Basque is necessarily a failure. Until the Keltic vocabulary has been thoroughly examined, and its non-Aryan residuum made out, it is impossible to compare it with those Basque roots which have been extracted from a comparison of the Basque dialects."[1]

I have every reason to believe that "the dissolving action of time," as Dr. Broca happily calls it, has obliterated the non-Aryan tongue, which may reasonably be believed to have been formerly spoken by the Neolithic aborigines of Britain. We have too many instances, writes Mr. Freeman, in "recorded history of nations laying aside the use of one language and taking to the use of another, for any one who cares for accuracy to set down language as any sure test of race. In fact the studies of the philologer, and those of the ethnologist strictly so called, are quite distinct, and deal with two different sets of phenomena."[2] Even if then we assume

[1] *Journ. Anthrop. Inst.*, vol. v. Part I., p. 26.

[2] *Contemporary Review*, "Race and Language," March 1877. On this question see also *Journal of Anthrop. Inst.*, v. i. pp. 1-29.

that there be no traces of Basque roots in the Celtic languages of the British Isles, that fact does not affect the question as to the origin of the small dark peoples of Wales, Scotland, and of Ireland.

Traces of the Neolithic Culture in Basque Dialects.

The identification of the Neolithic aborigines with the Iberic race of history, and with the modern Basques, is confirmed in a most unexpected manner by the recent philological inquiry carried on by the Abbé Inchauspé[1] into the dialects of the Pyrenees. He points out that the Basque names for cutting tools are as follow:—

Axe	*Aizcora.*
Pick . . .	*Aitzurra.*
Knife . . .	*Aizttoa.*
Scissors	*Aizturrac.*

Aizcora is composed of *aitz* (*aitza, atcha*), a stone, and *gora* high, lifted up = stone mounted in a handle.

Aitzurra = *aitz*, and *urra* to tear asunder, a stone to tear in sunder the earth.

Aizttoa = *aitz*, and "*ttoa*" a diminutive = little stone.

Aizturrac = *aiztto*, a small stone or knife, and *urra* to tear asunder, the final *c* marking the plural. This then means "little stones for tearing asunder," in contradistinction to *Aitzurra*, or a stone for tearing asunder —*i.e.* a great stone.

These words, with the exception of the third, which is confined to the Valley of Roncal in Spanish Navarre, are used by the Basque-speaking peoples both of France and Spain. Their derivations are accepted by Prince Lucien Bonaparte, and they prove that the Neolithic

[1] *Matériaux*, 1875, p. 218.

age has not passed away without leaving its mark behind among the non-Aryan inhabitants of France and Spain, in those places where the aboriginal population is to be found in its greatest purity. They point back to a time when the Neolithic civilisation and Iberic dialects spread over the whole of Europe north of the Alps and west of the Rhine, and probably also over Germany and Denmark.

Survivals from Neolithic Age.

The principal domestic animals and cereals, and many of the European fruits, are directly traceable, as we have seen, to the Neolithic age. The Neolithic population also is still represented by the Iberic and Celtic peoples. It is not, therefore, surprising that the Neolithic age should have left traces which survived, long after it had passed away, in the manners and customs of the European peoples of the succeeding ages. The polished stone axes were gradually supplanted, as will be seen in the next chapter, for purposes of every-day use by better implements of bronze, and ultimately came to be looked upon with awe and respect. In Italy, France, Germany, and Scandinavia,[1] in the Middle Ages, they were termed thunderbolts, and were supposed to be endowed with miraculous powers in healing the sick, and in averting the evil eye from men and beasts. In the two last countries they were termed Thor's hammers (Thor's

[1] Evans, *Ancient Stone Implements*, c. iii. Cartaillac, *L'Age de la Pierre dans les Souvenirs et les Superstitions Populaires*. Paris, 8vo. 1878. Mahudel, "Sur les prétendues pierres de fondre," *Matériaux*, 1875, p. 145. This paper was read in 1730. Moscardo, *Matériaux*, 1876, p. 1. Montélius, *La Suède Préhistorique*, Stockholm, 1874, 8vo. (Nilsson, Paris.

viggar). In Greece the smaller ones were used as amulets, and imitations of them were made in sardonyx and carnelian. Some even of the larger ones have been perforated for suspension.

Flint arrow-heads also had a superstitious value. In this country they are known as elf-darts, and their form is still preserved in carnelian necklaces used by the Bosnian peasantry.[1] They also sometimes form the central pendant of the magnificent necklaces found in the Etruskan tombs. The flint flake, universally used as a knife in the Neolithic age, was preserved by the superstition of succeeding ages, and long survived in ceremonials. It was used by the Egyptians for making the first incision in the body of the dead for purposes of embalming, and by the Israelites in circumcision. It was, however, more closely associated with the rites of burial. Those used in the circumcising of the Children of Israel were buried in Joshua's tomb.[2] Nor was this custom of burying flint flakes unknown in the West. In the Romano-British cemetery at Hardham[3] in Sussex, they were placed in an oaken chest containing the cinerary urn, the sandals, and the various other articles belonging to the dead. They have also been discovered in association with Romano-British remains in the camp at Worle Hill near Weston-super-Mare, and in the Isle of Thanet.[4] The latest instance of their having been used in this manner in Western Europe is that offered by the Merovingian

[1] One of these obtained by Mr. Arthur Evans is in Mr. John Evans' collection at Nash Mills.

[2] For a criticism on Exodus xxiv. 30 (*Septuagint*), see Evans, *Ancient Stone Implements*, p. 8.

[3] *Sussex Archæol. Coll.*, 1863.

[4] *Journ. Ethnol. Soc. Lond.* i. p. 8.

cemetery of Caranda[1] in the commune of Fère-en-Tardenois, Aisne, in which great numbers of flint flakes and arrow-heads, and in some cases fragments of polished stone scrapers were found along with a battle axe, and the characteristic Merovingian brooches interred with the bodies. Their abundance is accounted for by the fact of the cemetery having been situated near the spot where the flint implements were manufactured, like that described at Cissbury. In other Merovingian cemeteries the flint implements are scarce, and are, according to M. de Mortillet, found under conditions which show them to have been used as amulets. In Britain, therefore, we may conclude that flint flakes were used in burial ceremonies in the Romano-British age, as late as the fourth century after Christ, and in France as late as the Frankish conquest. A parallel case of survival in religious ceremonial, after the things had passed away from every-day life, is that of the sacerdotal vestments in the Christian churches, in which the ordinary dress of the Roman gentleman of the time has been preserved.

The Neolithic civilisation formerly spread over Northern Africa, the whole of Europe, and Asia, the islands of the Pacific, and the Americas, and lingered in remote places until the introduction of iron in the course of the present century. In the days of Captain Cook it was to be studied in nearly all the islands of the Pacific, and perhaps may still survive in some remote islet as yet unvisited by European sailors.

[1] *Matériaux*, 1875, p. 105.

Superstitions handed down from the Stone Age.

We have seen in the preceding chapter that in the Neolithic age the tombs were the habitations of the dead,[1] in which they were supposed to live. This superstition has been current in Europe from that remote age to the present time. The Scandinavian warriors, who had entered the gates of Walhalla and sat in Odin's Hall, made visits to their tombs on the earth. Helge, one of the heroes of the Edda, in spite of the magnificent welcome which he received from Odin, returned on horseback into his tumulus, accompanied by many horsemen. There he received the visit of his surviving wife, who lay down by him in the sepulchre. The inhabitants of the tumuli—the spirits of the mountain, the Voettir, the Elves, and the Manes,—are traceable over the greater part of Europe, and are supposed still to be able to avenge themselves on mortals by whom they have been disturbed. The tumuli in the Isle of Man are protected from destruction by this superstition: and it is reported in the island that the dread of their occupants is still so strong, that about the year 1859 a farmer offered a heifer as a burnt-sacrifice, that he might avert their anger, excited by the exploration of a chambered tomb near the Tynwald Mount by Messrs. Oliver and Oswald. This is probably the last example of a burnt-sacrifice in civilised Europe.

On some of the stones composing the tombs in Britain and Ireland are to be seen small round holes, seldom more than three-quarters of an inch to an inch deep. These have evidently been made on purpose,

[1] C. F. Wiberg, *Matériaux*, 1877, p. 408.

and they have been traced, by M. Desor[1] and others, over a large part of Europe, from the Pyrenees to Scandinavia, sometimes occurring on tombs, and at others on isolated blocks of stone. They are called cups, bowls, basons, "marmites du diable," and in some places in Germany "stones of the dead." From these names, coupled with the fact that at the present time they are filled with butter or lard, Mad^lle. Mestorf concludes that they were intended to hold offerings to the souls of the dead, who were waiting again to be clothed with a human body to appear among mortals. The prosperity of the living would depend on their good will. This superstition has taken deep root in the religious sentiment of Europe, and, like many others, has been sanctioned by Christianity. Sometimes the bowls are accompanied with Christian signs. In the neighbourhood of Niemegk-in-der-Mark, in Prussia, there is a holed stone bearing the name of Bischofs-stein, and the figure of a cross and of a cup. In no less than twenty-seven churches in Prussia, and two in Sweden, these holes have been made in the walls of the churches after they were built. In the town of Griefswald it used formerly to be the practice to get rid of fevers and other maladies by blowing into them. Sometimes they bear marks of having been recently filled with grease. According to M. Hildebrand, the Swedish peasants of the present day call them elfstones, and place in them needles, buttons, and the like, as offerings to the elves. These holes have been observed in some of the Icelandic churches built by Scandinavian colonists. The "cup-stones," as they are termed by the countrymen, are still pointed out to the stranger on the moors near Eyam, Derbyshire, and

[1] Desor, Falsan, and Mestorf, *Matériaux*, 1878, pp. 259-287.

were used for offerings when the village was desolated by the Plague. The Pin Hole Cave, in Cresswell Crags, derives its name from the habit of putting pins into a hole, and is to be looked upon as a survival of this superstition in the north of England, which has been traced as far south as the Pyrenees, and has left its mark in the holed-stones of India. The worship of ancestry is probably one of the oldest forms of worship, if not the oldest, in the world, and it still survives in Europe in the respect paid to elves, fairies, and "little-men."

General Conclusions.

From the facts mentioned in the last two chapters, it will be seen that the continuity between the Neolithic age and the present day has been unbroken. It is marked not merely by the physique of the present Europeans, by many of the domestic animals and cultivated seeds and fruits, and many of the arts, but by the testimony of language, and it is emphasised by the survival of the Neolithic faith in the shape of widely-spread superstitions. In every respect the Neolithic immigrant into Europe was immeasurably superior to the Palæolithic man of the caverns.

At the beginning of the Prehistoric period the small, dark, non-Aryan farmers and herdsmen passed into Europe from Central Asia, bringing with them the Neolithic civilisation, which took deep root. The section of them which spread over Gaul, Spain, and the British Isles, is only known to us as the Iberic aborigines. Outside these limits we meet with traces of the Iberic peoples in Sicily, Sardinia, and in Northern Africa. They have also left their mark in Asia Minor in the

name Iberia (= Georgia), in the same manner as the Gauls have left their name in Galatia, or modern Anatolia, south of the Aladag mountains. After a lapse of time sufficient to allow the non-Aryan Neolithic civilisation to penetrate into every part of the Continent, the Celtic Aryans poured in, and made themselves masters of a large part of Gaul and Spain in the Neolithic age. It may be inferred from the geographical position of Germany, as well as from the distribution of the human skulls, and the evidence of history, that it also was held by these two races of men. The Iberic peoples were probably driven from the regions east of the Rhine by the Celts, and they in their turn by the Belgæ, just as within the Historic period the Belgæ were pushed farther to the west by the Germans, who in their turn were compelled to leave their ancient homes to be occupied by Sclaves. Thus we have evidence of two distinct races in Neolithic Europe, the older, or non-Aryan, and the newer, or the Aryan. There is no reason to believe that the Iberic tribes derived their culture from, or were related in blood to, their predecessors the Cave-men. The progress of civilisation in Europe has been continuous from the Neolithic age down to the present time, and in that remote age the history of the nations of the west finds its proper starting-point.

CHAPTER X.

THE FURTHER DEVELOPMENT OF CULTURE.— THE BRONZE AGE.

Celtic Invasion of the British Isles.—Classification of the Bronze Age in Britain.—The Axe in Culture.—Habitations in Britain and Ireland in the Bronze Age.—Clothing and Ornaments.—Lighting Fires and Wood-cutting.—Spinning and Weaving.—Agriculture and Farming.—Pottery: Cups of Gold and Amber.—Bronze working.—Weapons and Warfare.—Burial Customs.—Temples.—Artistic Designs.—France and Switzerland in the Bronze Age.—The Early Bronze Age.—The Late Bronze Age.—Hoards of Bronze Merchandise.—Hoards of the Bronze-smith.—Lake-dwellings of Late Bronze Age.—Scandinavia in the Bronze Age.—Sculptures.—General Conclusions.

Celtic Invasion of the British Isles.

THE Iberic peoples lived in Britain, secure from invasion during the whole of the Neolithic age, while Gaul and Spain were being conquered by the ancestors of the Celts of history. In the course of time the knowledge of bronze was spread through the continent, and the great superiority of the civilisation, of which it is the emblem, led to the invasion of Britain. Bronze weapons ensured victory over enemies armed with the old weapons of stone, and consequently the introduction of the new material must necessarily have led to frequent wars. The knowledge of bronze must have affected the warfare

of the time in the same way as the introduction of gunpowder affected the warfare of the Middle Ages.

The tall, round- or broad-headed Celts described in the last chapter, composing the van of the great Aryan army, ultimately destined to rule the west, brought with them the knowledge of bronze into Britain, and are proved to have conquered nearly every part of the British Isles, by their tombs scattered over the face of the country, alike in England, Scotland, Wales, and Ireland. The conquered peoples survived probably in a state of slavery, and were only preserved from absorption in the west,—where farther retreat was forbidden by the waters of the ocean. They are proved, however, by the human skulls discovered in the Heathery Burn cave near Durham, in association with bronze articles, to have been living in north-eastern Yorkshire during the late Bronze age; during the time that the swords and spears, and other articles mentioned in the following list, were in use. Thus the Celtic conquest of Gaul was repeated in Britain, with precisely the same ethnical results (see Figs. 112, 113), the only difference being that the conquest of the one took place in the Neolithic age, while the conquest of the other spread the civilisation of the Bronze age over regions where it had hitherto been unknown.

The introduction of bronze into the other countries of Europe is not marked by an invasion like that of Britain. In Scandinavia the Neolithic inhabitants acquired the bronze civilisation without any evidence of the appearance of a new people, and in Switzerland and France the Neolithic stage of culture passed away without any break in the ethnical continuity. Nevertheless, for the reasons given above, the new weapons would necessarily

lead to warfare, and as the Celtic peoples to the east and south of Gaul would be likely to benefit first by the discovery, they would be the first to use the new weapons in their wars against their hereditary enemies the Iberic tribes of the west.

The use of bronze did not immediately drive out the use of polished stone in this country. In the tumulus, for example, at Upton Lovel,[1] Wilts, four flint celts, a perforated hammer-axe, numerous bone implements, and a bronze pin, were found along with the unburnt bones of the dead. In three barrows in Yorkshire also, the Rev. W. Greenwell[2] has discovered polished stone axes, in two cases along with the ashes of the dead, and with vases; and in a third under conditions which did not necessarily imply that it was connected with an interment. That these stone implements really belong to the Bronze age is proved by the practice of cremation and the presence of the characteristic pottery, unknown in this country before. While the chiefs and the rich possessed bronze implements and weapons, the poorer classes would naturally continue to use those of stone, and bronze could only have come into universal use when it became cheap.

The Classification of the Bronze Age in Britain.

The Bronze age in Britain is divided by Mr. Evans[3] into an early and a late stage, the first of which was a period of transition, when the use of bronze was superseding that of stone, and is characterised by the presence of bronze daggers (Figs. 114, 115) and plain wedge-

[1] *Archæologia*, xv. 124; xviii. 405.

[2] *Ancient British Barrows*, pp. 136, 179, 319.

[3] *Proceed. Soc. Antiq.*, 23d Jan. 1873. The Bronze Period.

shaped axes (see Fig. 116), originally modelled from a

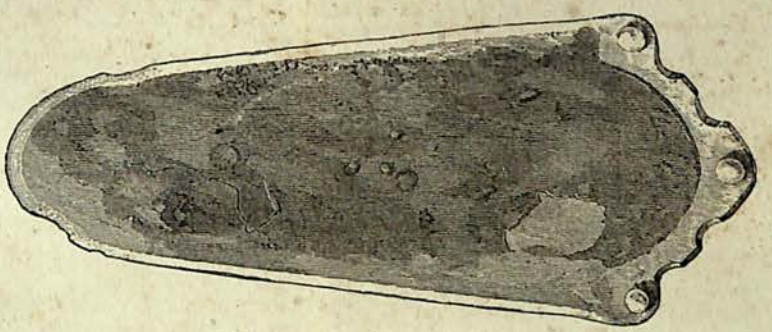


FIG. 114.—Bronze Dagger-blade, Round Barrow, East Kennet, Wilts, $\frac{2}{3}$.

prototype in stone. In one case in Italy a polished stone celt has been cast in bronze. To it belong nearly

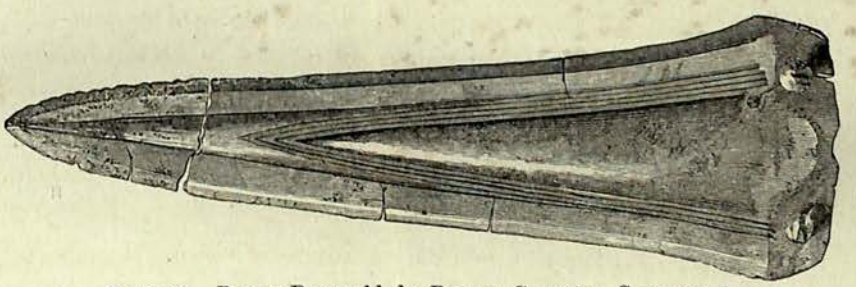


FIG. 115.—Bronze Dagger-blade, Barrow, Camerton, Somerset, $\frac{2}{3}$.

all the burial-places referable to the Bronze age in this country. In the following table the contents of those explored by the Rev. W. Greenwell[1] in the North of England, by Mr. Bateman[2] in Derbyshire, and Dr. Thurnam[3] in Wiltshire, are tabulated so as to show the manner in which the articles are associated together. It will be observed that the higher forms of bronze implements and weapons are entirely absent.

[1] Greenwell and Rolleston, *Ancient British Barrows*, 8vo, 1877.

[2] *Vestiges of the Antiquities of Derbyshire.* For detailed tables, see Lubbock, *Prehistoric Times*, 4th edit. pp. 148-151.

[3] *Archæologia*, xliii. pp. 285 *et seq.*

ARTICLES OF EARLY BRONZE AGE IN BRITAIN AND FRANCE.

Material.	*Name.*	Greenwell. North of England.	Bateman. Derbyshire.	Thurnam. Wiltshire.	Chantre. Chambered Tombs, Cevennes.
Stone.	Arrows	11	24	6	1145
	Lances	1	31	...	
	Poignards	...	3	3	63
	Knives	50	4	...	
	Scrapers	30	5	...	180
	Chisels	...	2		
	Saw	1			
	Axes	2	2	4	17
	Axe-hammers	4	1	7	
	Beads	1	...	...	5761
	Whorls	...	...	...	531
	Pendants	...	...	...	69
	Button	1			
Shell.	Pendants	...	...	...	258
	Necklace	1			
Bone and Teeth.	Pendants	...	...	...	185
	Pins	23	7	18	43
	Combs	...	2	...	
	Beads	4	1	4	267
	Tweezers	...	...	7	
Amber.	Beads	...	...	21	21
	Buttons	...	...	3	
	Rings	...	...	2	
Jet.	Buttons	16	1	4	
	Rings	7	...	7	
	Beads and Pendants	12	2	17	
Glass.	Beads	...	...	13	41
Gold.	Ornaments	...	...	19	
Bronze.	Plain Axe	1	1	5	1
	Knives	2	...	...	1
	Daggers and Knife Daggers	4	12	60 ...	22
	Lances	...	...	...	3
	Arrow-heads	...	...	...	29
	Drill	1	...	38	
	Pins and Awls	15	9		13
	Bracelets	...	...	1	37
	Finger-rings	...	...	...	29
	Rings	...	...	...	67
	Ear-rings	2			
	Buttons	...	...	...	19
	Beads	...	...	1	278
Pottery.	Pottery	199	23		
	Bead	1			
Number of Burial-places		210	90	350	

The later division of the Bronze age is characterised by the appearance of swords, spears, palstaves, and socketed celts; and by more elaborate ornaments and implements, which are known to have been used at the same time from their having been found together. The following list represents some of the more important forms discovered in Britain :—

ARTICLES OF LATE BRONZE AGE IN BRITAIN.

	Nottingham. *Proceed. Soc. Antiq.* ss. i. p. 332.	Guildsfield. *Proceed. Soc. Antiq.* ss. ii.	Ty-Mawr, Holyhead Mountain. *Archæol. Journ.* xxiv.	Granta Fen, Ely. *Proceed. Soc. Antiq.* ss. ii. 103.	Quantock Hills. *Archæologia*, xiv. p. 93.	Heathery Burn Cave, Greenwell.
Bronze.						
Implements—						
Palstaves	1	1	...	...	×	
Socketed Celts	16	...	×	...	...	×
Mould for Celts	...	...	...	...	...	×
Knife	1	...	...	...	...	×
Chisels	...	...	×	...	...	×
Gouges	...	...	...	...	...	×
Tongs	...	...	...	...	...	×
Razors	...	...	...	...	...	×
Weapons—						
Socketed Spear-heads	4	1				
Socketed Daggers	...	...	×	×	...	×
Swords	6	1	×			
Scabbards	...	1	...	...	...	×
Ornaments—						
Circular Ornament	1					
Quadrangular tube	1					
Rings	...	...	×	...	...	×
Armlets	...	...	×			
Bracelets	...	...	...	...	...	×
Pins	...	...	...	...	...	×
Gold.						
Torques	...	...	...	×	×	
Armlets	...	...	...	×		
Ornaments of Split-ring type	...	...	...	...	...	×
Amber.						
Beads	...	...	×			

These two divisions are represented also in Ireland, and to the latter of them we may refer many of the simpler forms of gold ornaments which have been found from time to time in that country, as well as hoards of the kind discovered in Dowris bog (see p. 363).

The early and late divisions of the Bronze age shade off into one another, and may have been the result of the gradual development of commerce. The absence of the higher forms from the burial-grounds may have been caused by the practice of burying the simpler forms with the dead, although both may have been in use at the same time. On the one hand it may be argued that the lower must have preceded the higher in point of time, and, on the other, that this only applies to the evolution of form in general, and that it does not afford ground for the view, that in any given country the two may not have been introduced from some other region at approximately the same time. The knowledge of bronze was undoubtedly introduced into Britain from without, and in the natural course of events the simpler forms would be the first to arrive. On taking into consideration the light thrown on this point by the discoveries on the Continent, it is very probable that the wedge-shaped axe and the dagger, and personal ornaments, were the first articles of bronze known among the Neolithic peoples of the north, and it is very likely that the habit of burying them continued down to the later age of Bronze. The people in those days must have buried their dead, and if the above hypothesis be not held, it is impossible to explain the exceeding rarity of the higher forms in their tumuli. Two socketed spear-heads,[1] one

[1] Crawford, Lanark, *Journ. Brit. Archæol. Assoc.* x. 7, xvii. 110; Wilsford, Wilts, *Archæologia*, xliii. 163.

palstave,[1] and one socketed celt,[2] have been recorded from burial-places of the Bronze age in Britain.

We must also remark that bronze has been used in all ages since the Neolithic, and that many of the more beautiful bronze ornaments, and the shields and armour, found in this country, probably belong to the age of Iron. In cases of the discovery of isolated articles, the age can only be ascertained by the forms and the style of ornamentation, and these are by no means certain guides, since frequently, under exceptional conditions, an ancient type may survive into an age very far remote from that in which it was normal.

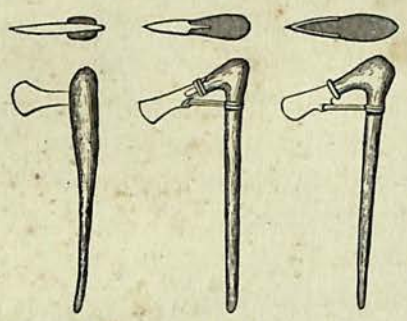
In dealing with the Bronze age in Britain and Ireland, I shall not attempt to distinguish between the early and the late stages, which cannot be treated in the limits of this work.

The Axe in Culture.

It is difficult to over-estimate the work done by the axe in advancing civilisation. The stone axes, easily blunted and broken, could have made but little impression on the vast forests of pine, oak, and beech, covering the greater part of Britain and the Continent in the Neolithic age. Clearings necessary for pasture and agriculture must unquestionably, then, have been produced principally by the aid of fire. Under the edge of the bronze axe, clearings would be rapidly produced, pasture and arable land would begin to spread over the surface of the country. With the disappearance of the forest the wild animals would become scarce, hunting

[1] Bryn Crûg, Carnarvon, *Archæol. Journ.* xxv. 246.
[2] Farway, Devon, *Trans. Devon. Ass.* iv. p. 300.

would cease to be so important, agriculture would improve, and a higher civilisation inevitably follow. When first the sound of the woodman's axe was heard in the forests of the north, the victory of man over his natural environment was secured, and forest and morass became his for ever. The invention of the metal axe is, therefore, of the highest importance in the history of civilisation, and its use marks a new phase in the history of Europe.



FIGS. 116. 118. 120.
Bronze Axes in Handles (Lane Fox).

The axes of the Bronze age consist of three distinct types.[1] The first and the oldest is that represented by the simple wedge secured by being fastened into the wooden handle in the manner shown in Fig. 116. An axe hafted in this manner must obviously in the course of time have split its handle, and to prevent this the

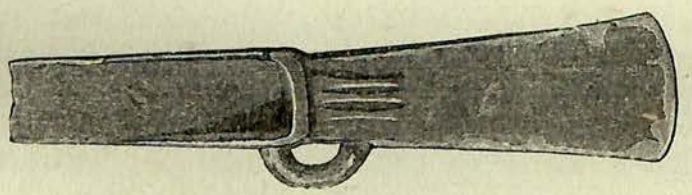


FIG. 117.—Palstave, Nettleham, Lincolnshire, ½.

form of Fig. 117 was invented, in which the handle was applied to the head as represented in Fig. 118. The edges of the simple wedge gradually developed

[1] See Gen. Lane Fox, *Journ. Royal United Service Instit.*, xiii., "Primitive Warfare;" and Mr. Evans, *Proceed. Soc. Antiq.*, 23d Jan. 1873, "on the Bronze Period."

flanges (Fig. 119), and passed into the palstave (Figs. 117, 118). This again proved inconvenient, and a third form was invented, in which the handle was let into a socket in the head of the axe, as in Figs. 120, 121. The second and the third of these have never been found in association with the first in this country.

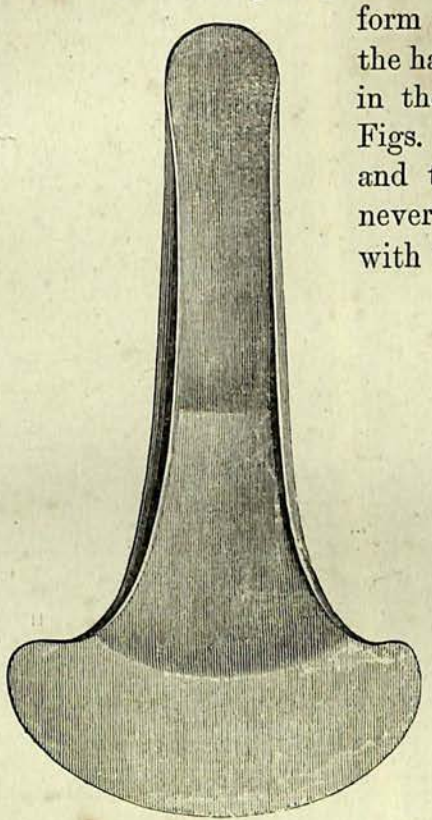


FIG. 119.—Flanged Axe, Arreton, Isle of Wight, ½.

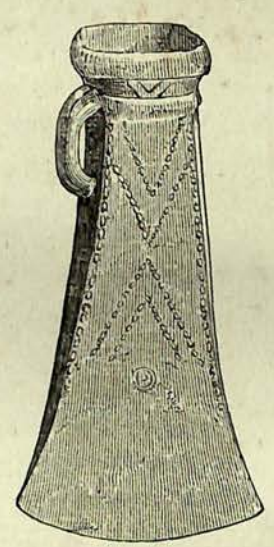


FIG. 121.—Socketed Celt, Thames, Kew. ½.

It is strange that the bronze-smiths should not have hit upon the mode by which we insert handles in our axes, which seems so natural and obvious, and it is still more so when we reflect that the hammer- and battle-axes of stone, perforated for the reception of the straight handle, were used in the early Bronze age.[1] These, however, were not copied from bronze

[1] For an account of these see Evans, *op. cit.* chap. viii.

originals.[1] The few which have been discovered in north Germany and Italy are obviously metallic reproductions of forms originally done in stone. The perforated bronze axes (Figs. 148, 149) found in Scandinavia are referred by Worsaae[2] to the Iron age of the south of Europe.

Habitations in Britain in the Bronze Age.

The houses of the Bronze folk in Britain were probably of the same sort as those of their predecessors, but may be assumed to have been larger and better built, because the tools were better. At the present time the round houses of the ancient Celtic inhabitants are represented by the round stone dwellings of the peasants still used in the north of Scotland and in the Orkneys. Sometimes, for the sake of protection, houses were built upon piles driven into a morass or bottom of a lake, as for example in Barton Mere,[3] near Bury-St.-Edmunds, where bronze spear-heads have been discovered, one eighteen inches long, in and around piles and large blocks of stone, as in some of the lakes of Switzerland. Along with them were vast quantities of the broken bones of the stag, roe, wild boar, and hare, to which must also be added the urus, an animal proved to be wild by its large bones, with strongly-marked ridges for the attachment of muscles. The inhabitants also fed upon domestic animals, the horse, short-horned ox,

[1] The bronze axes figured by Kemble and Franks in *Horæ Ferales*, pl. v. figs. 51 to 54, are modelled on well-known types of stone.

[2] Worsaae, *Primeval Antiquities of Denmark*, 8vo, 1849, p. 39.

[3] Explored by Rev. Harry Jones in 1867 ; *Suffolk Inst. of Archæology and Natural History*, June 1869.

and domestic hog, and in all probability the dog, the bones of the last-named animal being in the same fractured state as those of the rest. Fragments of pottery were also found. The accumulation may be inferred to belong to the late rather than the early Bronze age, from the discovery of a socketed spear-head.

This discovery is of considerable zoological value, since it proves that the urus was living in Britain in a wild state as late as the Bronze age. It must, however, have been very rare, since this is the only case of its occurrence at this period in Britain with which I am acquainted.

Lake Dwellings in Ireland.

The crannoges,[1] or platforms of clay and stone, interlaced with or supported by timber, and based on small shallows or islets in the Irish lakes, have been inhabited from the Bronze age to as late as A.D. 1641. In that year the crannoge in Roughan lake, near Dungannon, afforded shelter to Sir Phelim O'Neill, and it is proved to belong to the former age by the discovery of bronze spear-heads in the old refuse-heaps. In Mr. Kinahan's opinion some of these platforms supported a circular stockade within which the huts of the inhabitants were arranged under one roof common to all, which sloped from the stockade to a courtyard in the centre.[2]

The wooden cabins or huts, constructed of wattles or tempered clay, and the small stone houses, called cloghauns, in which the Irish peasantry have lived within the Historic period, are probably survivals from

[1] See Wilde, *Cat. R. I. Acad.*, vol. i. Keller, *Lake-Dwellings*, transl. J. E. Lee, 2d. edit. vol. i. *Archæol. Journ.*, vi. p. 101; i. p. 425.

[2] *Proceed. R. Irish Acad.*, x. part i. 31.

the Bronze age, just as the habit of using crannoges is also a survival. The same remark applies also to the round beehive huts of the Orkneys and the North of Scotland. The relation of "cloghauns" to the raths or forts, which abound in Ireland as well as in Britain, is shown by an appeal to the habits of the Irish in the sixteenth century. "So late as that time," writes Sir William Wilde,[1] "the native Irish retained their wandering habits, tilling a piece of fertile land in the spring, then retiring with their herds to the *booleys*, or dairy habitations (generally in mountain districts) in the summer, and moving about where the herbage afforded sustenance to their cattle. They lived, as Spencer describes them in the reign of Elizabeth, 'on their milk and white meats' (curds, cheese, with meal, and probably calves' flesh, etc.), and returning in autumn to secure their crops, they remained in community in their forts or entrenched villages during the winter. The remains of thousands of these forts or raths still stud the lowlands of every county in Ireland, notwithstanding the thousands which have been obliterated. They are earthen enclosures, generally circular, and varying in extent from a few perches to an acre or more, and afforded protection to the inhabitants and their flocks against the ravages of beasts of prey with which the country then abounded, or against the predatory incursions of hostile tribes either in war or during a cattle raid." A breastwork of earth from four to eight feet high surrounded the enclosure, being the material ready at hand, and the most easily worked, and was probably surmounted by a stake fence. In some a ditch surrounded the earthwork. Upon some of the plains, as well as the hill-sides, stone fortresses

[1] *Cat. R. Irish Acad.*, i. p. 99.

were occasionally erected, where such material abounded loose on the surface, or could be procured in the neighbourhood without quarrying. These duns or stone forts were always put together without cement, but they are more of a military than a domestic nature. In the circle of these forts, both stone and earthen, there existed chambers and galleries which probably served as granaries or places of security for the preservation of valuables, and to which the young and weak might resort in cases of invasion, or any sudden attack."

Caves were rarely used in the Bronze age as habitations. That at Heathery Burn[1] contained a large assortment of bronze articles, enumerated above (p. 347), with the remains of the Celtic short-horn and other animals. Two human skulls, discovered at the same time, are referred by Prof. Huxley to the long-headed Iberic type, described in the last chapter. Bronze implements of the late Bronze age have been discovered in three other caves in this country,—in the Cat Hole in Gower, in Thor's Cave in Staffordshire, and in Cave Dale, Castleton.

Clothing and Ornaments of the Bronze Folk in Britain.

In attempting to picture to ourselves the men of the Bronze age in Britain, it is necessary to make use of articles sometimes isolated, sometimes accumulated together in hoards, and at others buried with the dead. We will first of all deal with their personal appearance, and then pass on to a consideration of their mode of life.

The rich and the chiefs were clothed in linen, or in woollen homespun, fragments of which have been discovered by the Rev. W. Greenwell in the Scale-house

[1] *Cave-hunting*, c. iv.; *Geologist*, 1862; *Proceed. Soc. Antiq.* SS. ii. p. 177.

barrow, Rylstone,[1] Yorkshire. In Scandinavia they wore woollen cloaks, and a round woollen cap on the head, and their legs and feet were protected by leather leggings and sandals.[2] A dagger (Figs. 114, 115), attached to the girdle in a sheath of wood or leather, and an axe, of one of the three types above, were their constant companions—sometimes ornamented, as in Fig. 121, with various geometric patterns, either cast or hammered. The face was shaven, and the beard, moustaches, or whiskers were sometimes plucked out. The hair was worn long, and arranged into a pyramid sufficiently large, in some cases, to allow of the use of a hair-pin[3] (Fig. 122) twenty inches long. So careful were they of their *coiffure*, that they are proved, in the lake-dwellings of Switzerland, to have used head-rests made of pottery,[4] like those of the ancient Egyptians[5] in wood, to prevent its being disarranged in sleep. Similar articles are used by the Abyssinian dandies of the present day, and by other African peoples,

FIG. 122.—Bronze Hair-pin, Wandle.

[1] Greenwell, *British Barrows*, p. 375.

[2] At Dömmestorp in Holland; at Borum-Eshoc, near Aarhuus, in Jutland. Montelius, *La Suède préhistorique*, Stockholm, 8vo, 1874.

[3] Franks, *Archæol. Journ.* ix. p. 7. This was found at the mouth of the river Wandle, along with a bronze sword, a spear-head, and a palstave.

[4] Keller, *Lake-dwellings*, transl. J. E. Lee, pp. 175, 501, 565.

[5] Keller, pp. 178, 388.

whose wonderful head-dresses are described by Cameron and Stanley. They are also used in Japan and New Zealand. Earrings and necklaces were also worn, and pendants and amulets made of stone and bone, as well as bronze and glass.

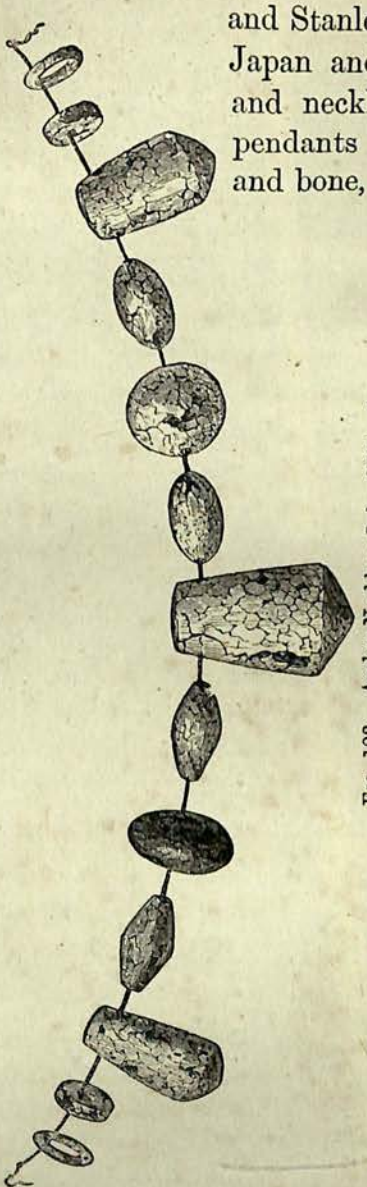


FIG. 123.—Amber Necklace, Lake, Wilts, ¾.

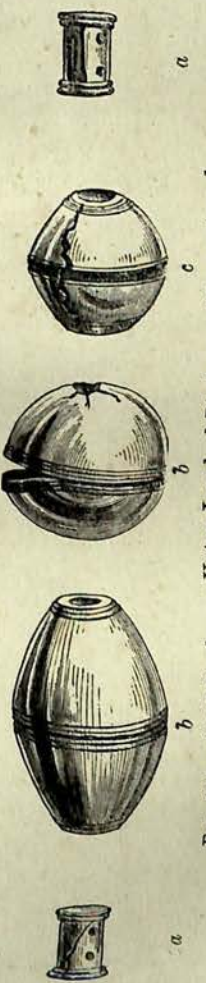


FIG. 124.—Gold Beads. *a* Upton Lovel; *b* Bircham; *c* Normanton, 1.

In Fig. 123 a necklace of amber is represented from a

tumulus at Lake, in Wiltshire.[1] The gold beads[2] in Fig. 124 show that sometimes their ornaments were made of precious metals. On their arms they wore bracelets, round, flat, or hollow, ornamented with various designs, generally in chevrons or right lines, either continuous or dotted, and sometimes with circles. The golden coronets or minns and collars worn in Ireland in the legendary times preceding history perpetuate a form of ornament in use in the Bronze age, as is proved by the identity of the patterns in chevrons and right lines (Fig. 146) with those on some of the bronze weapons. Similar ornaments in gold have been discovered in Brittany and Germany, and in Scandinavia in bronze, as in Fig. 147.

Lighting Fires and Woodcutting.

Fire was obtained in the Bronze age by striking a flint flake against a piece of iron pyrites, and these are sometimes found together in the tumuli, as in Fig. 125.

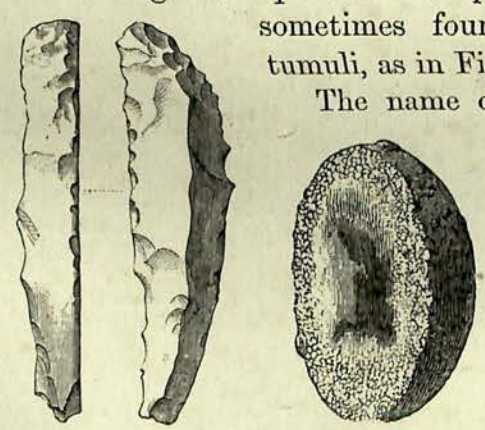


FIG. 125.—Strike-a-Light, Seven Barrows, Lambourne, Berks, ⅔.

The name of pyrites (πῦρ) is itself, as Mr. Evans remarks, sufficient evidence of the purpose to which the mineral was applied in ancient times; and the statement of Pliny that fire was first struck out

[1] Thurnam, *Archæologia*, xliii. p. 501.

[2] *Ibid.* xliii. p. 525.

of flint by Pyrodes, the son of Cilix, is a myth which points to the use of silex and pyrites rather than of steel.[1]

The important position of the axe in the Bronze civilisation is proved by its numbers; and the introduction of edged tools of metal must have caused a great improvement in the carpentery. Chisels, gouges, and adzes, and little bronze saws, from three to five inches long, apparently, from their small size, imitated from the serrated flint flakes of the Neolithic age, were their most usual tools for cutting wood.

Spinning and Weaving.

Spinning and weaving were carried to a higher pitch of perfection in the Bronze age than before. In the Neolithic age the material employed for fabrics was composed of linen; in that of Bronze the art of spinning wool into thread, and of weaving it into cloth, first makes its appearance. In the Scale-house barrow, Rylstone, to which we have already referred, the body had been covered from head to foot in cloth before being buried in the coffin, composed of a hollow oak trunk. The body had been turned into adipocere. It must be observed that woollen fabrics can be preserved only under very rare circumstances. They are completely destroyed by fire, and they rapidly decay in water; and it is only under those imperfectly known and exceptional conditions in which the body is turned into adipocere, and the bones into phosphate of iron, from the percolation of water charged with salts of iron, that they withstand decay. It does not therefore follow that the manufac-

[1] Evans, *Ancient Stone Implements*, p. 14.

ture of woollens was not commonly carried on in Europe in the Bronze age, because the cloth has been so rarely discovered.

Agriculture and Farming.

The domestic animals in the Bronze age in Britain were of the breeds introduced in the Neolithic age. The corn was probably the same, but possibly the oats and beans, which appear for the first time in the lake-dwellings of the Bronze age in Switzerland, may have also found their way to Britain. The harvest was gathered in with reaping-hooks (Fig. 126) of the small kind used for cutting off the ears, after the manner universal among the Greeks and Romans. In the sketches of various scenes in the life of the Bronze folk in Scandinavia, the horse was employed both for riding and driving, and oxen were used for ploughing. This is likely to have been the case in Britain.

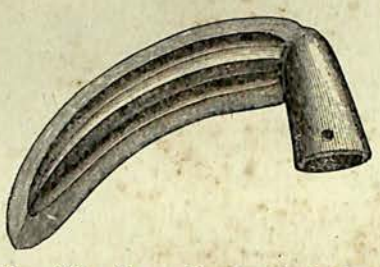


FIG. 126.—Bronze Reaping-hook, Tay.

Pottery.—Cups of Gold and Amber.

The pottery was made by the hand, and ornamented with various patterns in dots and right lines. It consisted of drinking cups of various sorts (see Fig. 127), cooking pots, cinerary urns, and small vessels, used for containing incense or sacred fire (Fig. 128). These were probably made in Britain. It is, however, an open question whether a gold cup, found at Rillaton,[1] in Corn-

[1] *Archæologia*, xliii. *Proceed. Soc. Antiq.* SS. iii. 517.

FIG. 127.—Drinking Cup, East Kennet, ½.

wall, was made in this country; and it is equally doubtful whether that of amber, found at Hove,[1] in a rude

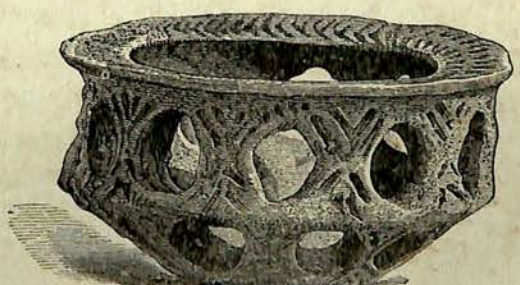


FIG. 128.—Incense Cup, Bulford, Wilts, ⅔.

[1] *Sussex Archæol. Coll.* ix. 119.

open coffin, buried in a tumulus, is a piece of British workmanship. If it be, it proves that the use of the lathe was known in Britain at the time. It is turned in the lathe, with lines engraved on the handle, and was associated with a perforated hammer-axe made of iron-stone, and a whetstone, as well as a bronze dagger of the usual type.

Bronze-Working.

The fashioning of bronze in this country into various articles is proved by the discoveries of stocks in trade of bronze-smiths, in which hammers, anvils, cold chisels, pointed awls, and stamps have been met with for working the bronze. Moulds also in stone and in bronze were used for casting, and are sometimes found along with broken implements and ornaments ready for the smelting-pot. The bronze mould (Fig. 129) found in Heathery Burn cave (see p. 347) was discovered along with celts which had been cast in it.[1] It is evident, therefore, that implements were made in this country, as they were in France, Germany, and Scandinavia. The bronze-smiths were acquainted with the art of casting, of hardening the bronze by hammering, of beating it out into thin plates, and

FIG. 129.—Bronze Celt Mould, Heathery Burn, ½.

[1] For an account of the bronze-working, see Evans, *Proceed. Soc. Antiq.* 1873, on "The Bronze Period," pp. 20-21.

working it in *repoussé*. The two last processes were probably introduced after the first was known, although, when the first art had once been learnt, the others would quickly follow.

Dr. Robinson laid before the Royal Irish Academy,[1] in 1848, an interesting discovery of bronze articles in Dowris bog, near Parsonstown, King's County, Ireland. They consisted of thirteen bronze trumpets, some cast, and others with riveted seams, thirty-one celts, twenty-nine spear-heads, three gouges, thirty-one bells, several bronze vessels of large size, of which one in the possession of Lord Rosse is composed of two pieces of bronze neatly riveted together. Some of the objects were imperfectly cast, others had been injured and broken up. There were also small jets of metal which had overflowed from the moulds, and pieces of sandstone used for polishing, all of which showed that the accumulation of implements and weapons formed the stock in trade of a bronze-founder, similar to those met with in England, and still more abundantly in France. The bells are small, hollow, and pear-shaped, with rings at the top for suspension, and a loose piece of metal inside. In general form they resemble the bells attached to horses, and were probably intended for that purpose. This collection of articles belongs to the late Bronze age, and it proves that bronze-smiths carried on their craft in Ireland as well as England. Stone moulds found in Ireland have been described by Sir W. Wilde.

[1] *Proceed. R. I. Academy*, iv. pp. 237, 423; Wilde, *Cat.*, 603, Fig. 525. Kemble and Franks, *Horæ Ferales*, p. 49.

Weapons and Warfare.

The principal weapons for close combat, introduced by the Bronze folk into Britain, were the bronze axe and the dagger (Figs. 114 to 121), to which must be added in the later Bronze age, short, pointed, double-edged swords (Figs. 130, 131), sometimes leaf-shaped, and with small handles made of wood; more rarely the last had handles of bronze, adorned with spirals or chevrons. For fighting at a distance flint arrows were used, and in the early Bronze age javelins of various sizes tipped with flint. A set of four of these was found in the stone chamber at Winterbourne Stoke[1] (Figs. 132, 133). These were afterwards replaced by bronze-headed spears and javelins (Figs. 134, 135, 136). Axe-hammers (Fig. 140) or stone maces, sometimes beautifully polished and ornamented with various patterns, were employed in the early Bronze age, and have been imitated in

FIG. 130.—Bronze Sword, Thurston, Whittingham, Northumberland, ¼.

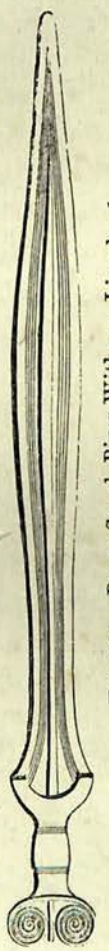
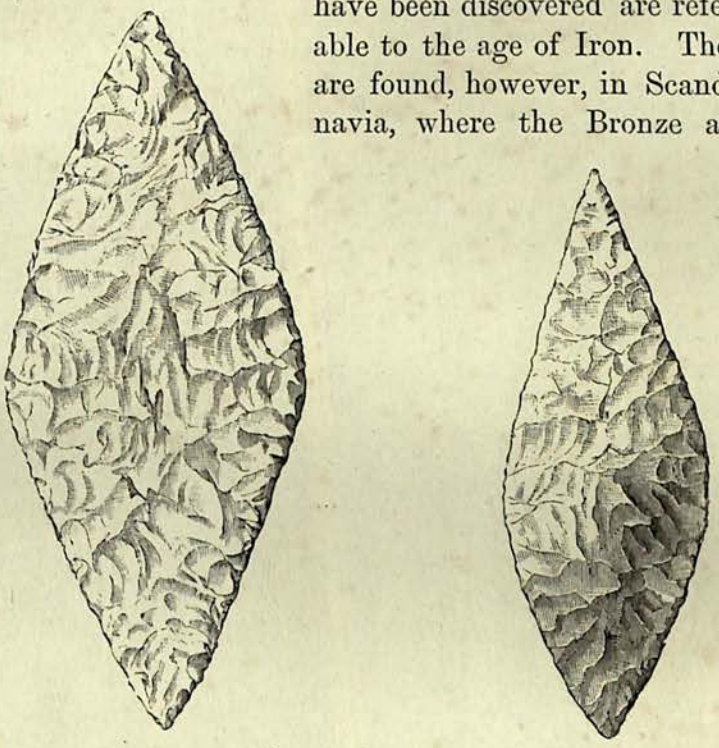


FIG. 131.—Bronze Sword, River Witham, Lincoln, ⅛.

[1] Way, *Archæol. Journ.* 1867. Owen Stanley, *Memoirs on Ancient Dwellings in Holyhead Island.* 8vo. 1871.

bronze in Germany and Italy. It is an open question whether bronze shields and armour, or helmets, were used in Britain in the Bronze age, since those which have been discovered are referable to the age of Iron. They are found, however, in Scandinavia, where the Bronze age



FIGS. 132, 133.—Two out of a set of four Javelin-heads, Winterbourne Stoke, ¼.

lasted as late as the Christian era. Those in Britain were probably made of hide or wood.

Many of the camps made by the Neolithic inhabitants of Britain were occupied by the invading Celtic tribes, and some of those with the walls built of stones rudely fitted together,—such as that crowning Holyhead Mountain[1] in Holyhead Island,—are proved by the implements

[1] Way, *Archæol. Journ.* 1867. Owen Stanley, *Memoirs on Ancient Dwellings in Holyhead Island.* 8vo. 1871.

found in and around them to date as far back as the Bronze age. Camps of this kind are very numerous, and imply that the tribes were frequently at war with each other, as in the preceding Neolithic age.

Burial Customs.

The invasion of Britain by the bronze-using Celtic tribes is marked by a striking change in the customs of burial, which probably is the sign of the introduction of a new faith. In the Neolithic age

FIG. 134.—Bronze Spear-head, Heathery Burn, ½.

FIGS. 135, 136.—Bronze Spear and Javelin Heads, Thurston, Whittingham, Northumberland, ¼.

the dead were interred surrounded by the implements, weapons, and ornaments for use in the future life. In the Bronze age the dead were burned,—were purified by being passed through the fire, along with their possessions. Cremation, however, did not altogether abolish the older practice of inhumation. It is evident that both were carried on simultaneously, from the researches of Thurnam in the south of England, Bateman in Derbyshire, and Greenwell in the northern counties. The one may have been connected, as Dr. Fred. Wiberg suggests, with the worship of fire, and the other may have been employed by the descendants of the Neolithic Britons from the force of habit, and from its cheapness by the poorer classes.

The barrows and cairns of the Bronze age are generally round, and without large sepulchral chambers with

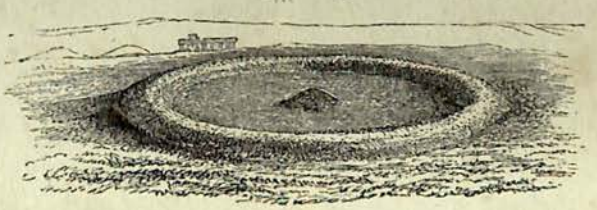


FIG. 137.—Disc-shaped Barrow.

passages leading into them, such as we have seen in the more important Neolithic burial-places. In Scotland, however, and in Ireland and in France, large sepulchral chambers of this age are not uncommon. Sometimes the barrows are disc-shaped, and consist of a circular area about a hundred feet in diameter, surrounded by a ring of earth and a ditch with a low mound, or mounds, to mark the interment in the centre (Fig. 137). Sometimes they are bell-shaped, and at others bowl-shaped (Figs. 138, 139) or oval. These varieties have been

chiefly met with in the south of England.[1] In cases of

FIG. 138.—Bell-shaped Barrow.

inhumation the dead were usually buried in the contracted posture, as in the oval tumulus at Winterbourne

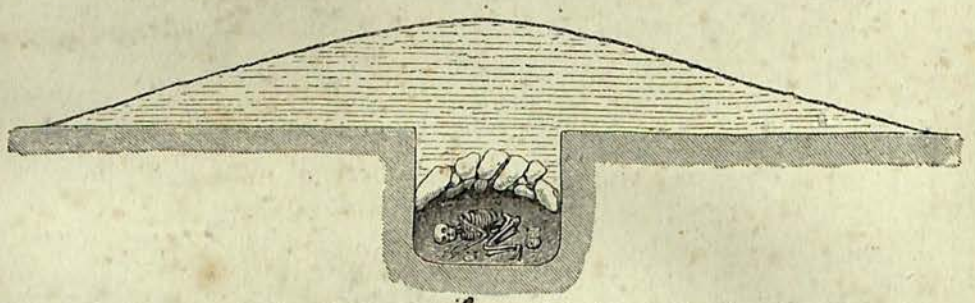


FIG. 139.—Section of Bowl-shaped Barrow, East Kennet, Avebury, Wilts.

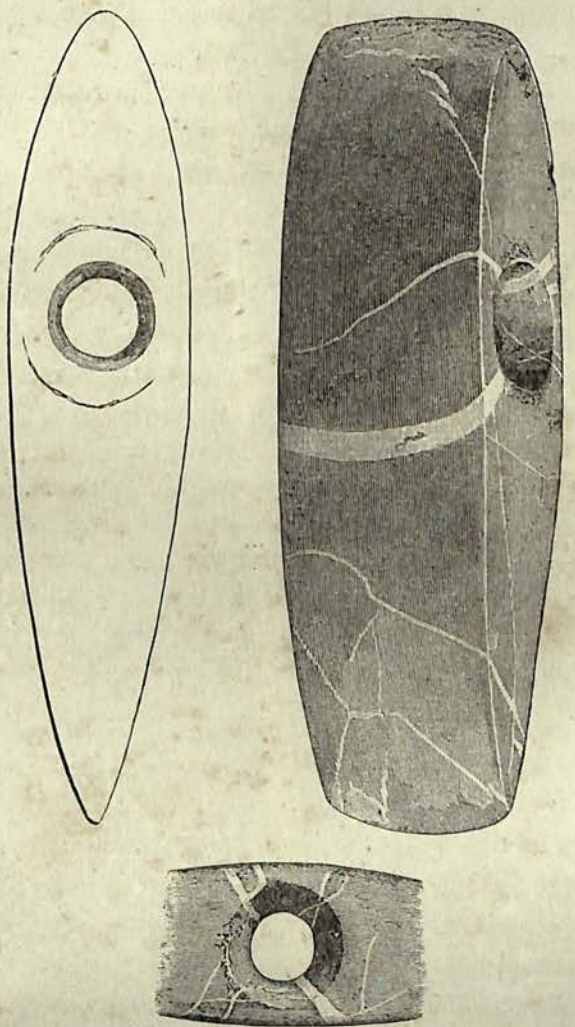
Stoke,[2] along with flint javelin-heads (Figs. 132, 133), and a drinking cup, and in the bowl-shaped barrow at East Kennet, along with a drinking cup figured above (Fig. 127), and a hammer-axe (Fig. 140). Sometimes the body, covered with linen or woollen clothing, rested at full length in a coffin made of the hollow trunk of an oak[3] which had been split in two. Where cremation was practised the ashes of the dead

[1] They have been classified by Thurnam, *Archæologia*, xliii. p. 285.

[2] *Proceed. Soc. Antiq.* S. ii. 427.

[3] Gristhorpe, and Scale-house Barrow, Rylstone, Yorks, Hove, near Brighton. Williamson, *Tumulus near Gristhorpe.* 4to. Scarborough, 1836. Greenwell, *British Barrows*, p. 375. 8vo. London, 1877. Barclay Phillips, *Sussex Archæol. Coll.*, ix. 119.

were collected into a funeral urn, usually from twelve to eighteen inches high, and placed in a chamber,



LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

FIG. 140.—Stone Axe-hammer, East Kennet, ⅔.

either standing upright with its mouth covered by a slab of stone or by flint, or with its mouth downwards as in the secondary interment in the Winterslow

barrow (Fig. 141). Various articles and implements of daily use were thrown into the fire,[1] and the burnt remains were sometimes placed in the urn with the ashes of the dead. The implements, weapons, and ornaments, enumerated in the list, p. 346, were also interred for use in the world of spirits, together with drinking cups of the type of Fig. 127, and more rarely with curious perforated earthenware vessels (Fig. 128), which probably were used either to carry the sacred fire with which to light the pile, or as censers in the funeral ceremonies; food also was placed for the dead, as well as flakes and splinters of flint. The tumulus or cairn was carefully raised over the urn, and the memory of the dead maintained by periodic feasts, after which either earth or stone was added to the height of the mound or cairn, each feast being represented by a layer of broken and burnt bones of the short-horned ox, horse, sheep or goat, and hog, together with charcoal.

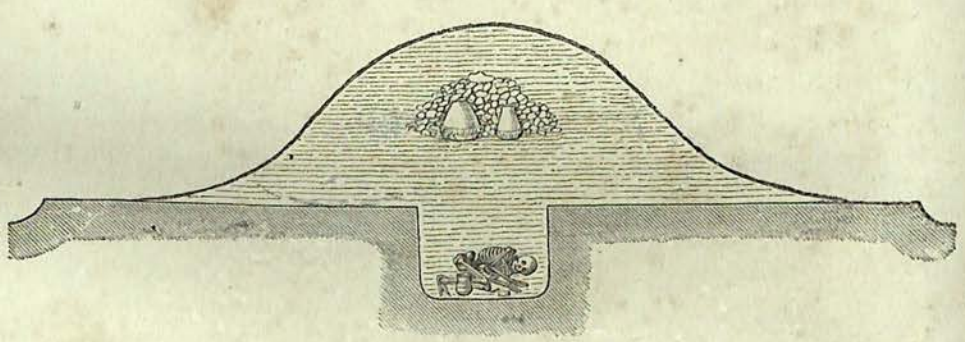


FIG. 141.—Bell-shaped Barrow at Winterslow.

It not unfrequently happens that a barrow or cairn

[1] In 1878 Mr. Rooke Pennington and myself obtained an urn out of a cairn on Lose Hill, Castleton, Derbyshire, in which a flint knife had been placed. Its surface was covered with a fine glaze from the fusion of the flint in contact with the alkali in the wood ashes of the funeral fire.

is found to contain examples of both modes of disposing of the dead. Generally the primary interment is that by inhumation; and the secondary, as in the accompanying Fig. 141, by cremation. In some cases, however, this arrangement is reversed.

If the articles found in the barrows in the above table (p. 346) be examined, it will be seen that the inhabitants of the southern counties, in the Bronze age, were richer and more civilised than those of the midland and of the north. This would inevitably follow from the introduction of the Bronze civilisation from the Continent: the nearest portions of Britain to France must then, as later in the days of Cæsar, have been greatly influenced by contact with the inhabitants of northern Gaul.

Temples of Bronze Age—Avebury—Stonehenge.

The numerous circles of stone or of earth in Britain and Ireland, varying in diameter from 30 or 40 feet up to 1200, are to be viewed as temples standing in the closest possible relation to the burial-places of the dead. The most imposing group of remains of this kind in this country is that of Avebury (Fig. 142), near Devizes, in Wiltshire, referred by Sir John Lubbock to a late stage in the Neolithic or to the beginning of the Bronze period. It consists of a large circle of unworked upright stones 1200 feet in diameter, surrounded by a fosse, which in turn is also surrounded by a rampart of earth. Inside are the remains of two concentric circles of stone, and from the two entrances in the rampart proceeded long avenues flanked by stones, one leading to Beckhampton, and the other to West Kennet, where

it formerly ended in another double circle. Between them rises Silbury Hill, the largest artificial mound in Great Britain, no less than 130 feet in height. This

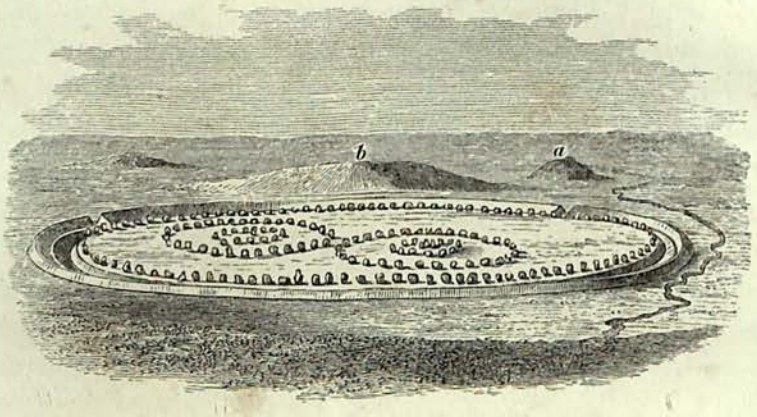


FIG. 142.—Avebury, restored by Mr. Fergusson. *a*, Silbury Hill; *b*, Waden Hill.

group of remains was at one time second to none, "but unfortunately for us the pretty little village of Avebury, like some beautiful parasite, has grown up at the expense and in the midst of the ancient temple, and out of 650 great stones, not above twenty are still standing."[1] In spite of this it is still to be classed among the finest ruins in Europe.

The famous temple of Stonehenge[2] on Salisbury Plain is probably of a later date than Avebury, since not only are some of the stones used in its construction worked, but the surrounding barrows are more elaborate than those in the neighbourhood of the latter.[3] It consisted of a circle (Fig. 143), 100 feet in diameter, of large upright

[1] Lubbock, *Prehistoric Times*, p. 123. 1878.

[2] In the account of Stonehenge I have followed Mr. Stevens. *Wilts Archæol. and Nat. Hist. Soc.*, Salisbury Meeting, Stonehenge Excursion, 1876.

[3] Lubbock, *Prehistoric Times*, 1878, c. v. Thurnam, *Archæologia*, xliii. p 309.

blocks of sarsen stone, 12 feet 7 inches high, bearing imposts dovetailed into each other, so as to form a

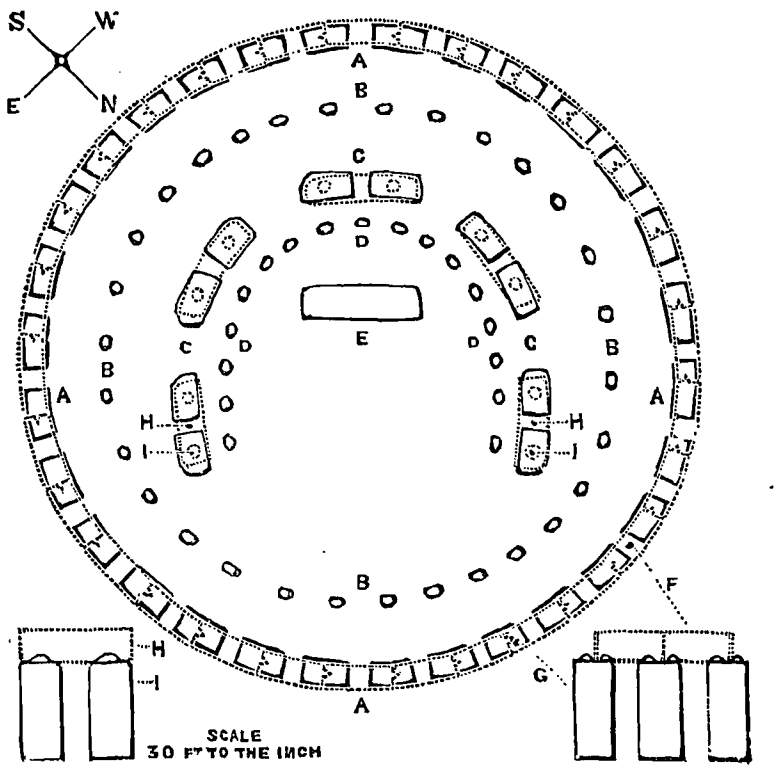


FIG. 143.—Ground-plan of Stonehenge as it probably was. (Stevens.)

continuous architrave (see Fig. 143). Nine feet within this was a circle of small foreign stones, B of figure, and within this five great trilithons of sarsen stone, C, forming a horseshoe; then, D, a horseshoe of foreign stones, eight feet high, and in the centre a slab of micaceous sandstone called the altar-stone, E. When perfect it probably formed a temple like the restoration (Fig. 144) made by Mr. Brown. At a distance of 100 feet from the outer line a small ramp, with a ditch outside, formed the outer circle, 300 feet in diameter, which cuts a low barrow and in-

cludes another, and therefore is evidently of later date than some of the barrows of the district. A foreign

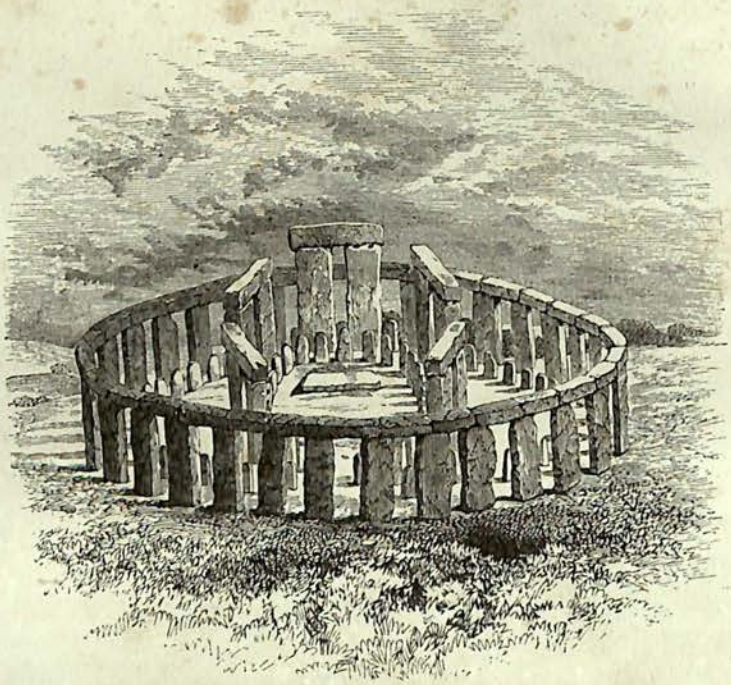


FIG. 144.—Stonehenge as it probably was. (Brown.)

block near the first great trilithon, on the north-eastern side, has two holes in it (Fig. 145A), which, in the opinion of Mr. Stevens, have probably been intended to receive libations like the elf-stones and cup-stones described in the last chapter. The present ruined condition of Stonehenge is represented in Fig. 145A, borrowed from the work of Mr. Stevens.

The foreign stones, composing the inner circle and the inner apse, some of which are igneous, may have been derived from Wales, Cornwall, or from the Channel Islands. It is obvious that they would not have been transported to Salisbury Plain excepting under the influ-

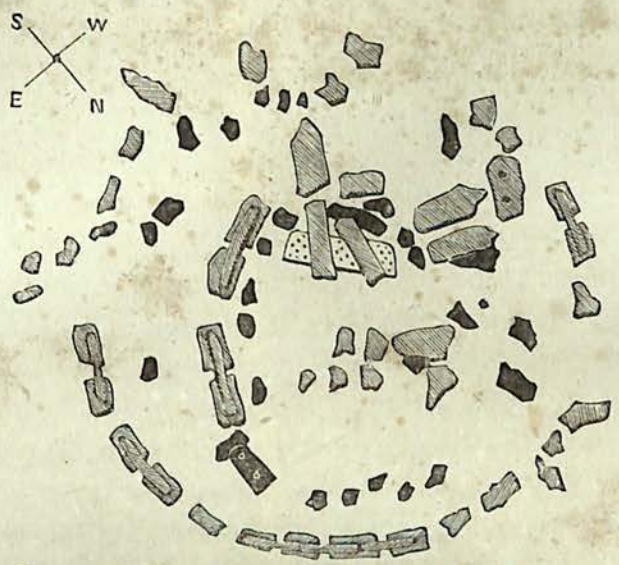


FIG. 145A.—Ground-plan of Stonehenge as it is. (Stevens.)

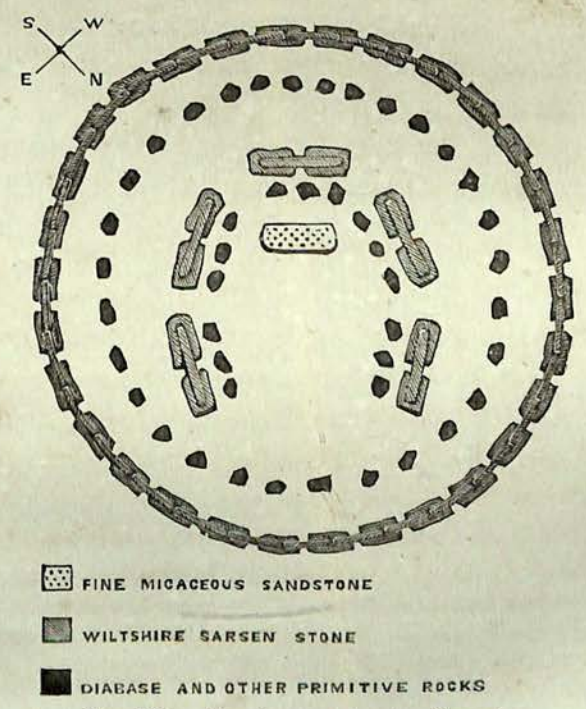


FIG. 145B.—Stonehenge restored. (Long.)

ence of some strong religious feeling; and a peculiar value must have been attached to the material, since the stone of the neighbourhood would have satisfied all the purposes of a monument.

"If Stonehenge," writes Mr. Stevens, "was erected at two distinct periods, the horseshoe and circle of *foreign* stone (Figs. 143, B D, and 145) probably formed the earlier temple. It may even have been erected elsewhere at some former period, and then transported to Salisbury Plain and again set up. An intrusive and conquering people may have brought these hallowed stones with them, and have added to the impressive appearance of their old temple, in its new situation, by repeating its features on a far larger scale, using local stone for the purpose." The buildings surrounding the shrine of the Kaaba at Mecca, and the *Casa Santa* at Loreto, are modern examples of ancient shrines encased in later and more magnificent temples.

The date of both of these temples[1] is indicated by the surrounding tombs. According to Dr. Thurnam, barrows of the Bronze age cluster thickly around Avebury, 106 being still to be seen in the sixteen square miles near it; while round Stonehenge Sir Richard Colt Hoare counted 300 within twelve square miles, and in the days of Stukeley 128 were visible from a hill close by.[2]

These two great temples of an unknown worship represent the Canterbury Cathedral or Westminster Abbey of the period, while the smaller circles to be

[1] I am unable to accept the views of Mr. Fergusson that these are post-Roman. On this point see Lubbock, *Prehistoric Times*, c. v.; *British Quarterly Review*, Oct. 1872. "The Present Phase of Prehistoric Archæology," *Edinburgh Review*, April 1878, The Age of Bronze.

[2] *Archæologia*, xliii. p. 305.

found scattered over the moors and hilltops in the south of England, in Wales and Cumberland, as well as in Scotland, are to be looked upon as the parish churches and chapels of ease. It has been urged by Mr. Fergusson, in his interesting work on Rude Stone Monuments, that these circles are merely tombs. Even if we allow that they originally were tombs in every case, it does not follow that they have not also been temples, for the religious sentiment has in all ages and in all places tended to centre in tombs which ultimately have become places of worship. Many of our Christian churches have originated in this manner, and it is a most obvious transition from the tomb to the temple. The worship of the spirits of the dead at the one would naturally grow into the worship of the Great Unknown in the other. Probably the idea of both large and small circles sprang originally from the stones placed round the base of the circular hut, which was the usual habitation in the Prehistoric period.

Stone circles are to be found over the greater part of Europe and Asia, as well as in northern Africa, and they have been used as places of burial, worship, or assembly by various peoples. Their archæological date in each case can only be fixed by the remains in and around them.[1]

The large standing-stones or menhirs, by no means uncommon where large blocks of stone are easily obtained, may belong to the Neolithic as well as to the Bronze age, and have been objects of worship like the unwrought stone at Hyettos, adored by the Greeks as Herakles, or that taken for the Thespian Eros in

[1] For an interesting account of the distribution of circles, see Fergusson, *Rude Stone Monuments*.

the Bœotian festivals, or those worshipped by the Hindus.[1]

Hollows or cups for the reception of the offerings to the spirits of the dead are recorded by Sir James Simpson[2] on several megalithic circles and avenues, as well as on menhirs, and the stones of cromlechs, and chambered tumuli. Some of these probably belong to the Bronze as well as to the Neolithic age.

Artistic Designs.

The designs on articles of the Bronze age in Britain and Ireland are nearly all geometric, and animal forms are not represented. They are either stamped, cast, or engraved on metal, or stamped or moulded on pottery. Those figured below (Fig. 146) represent the principal

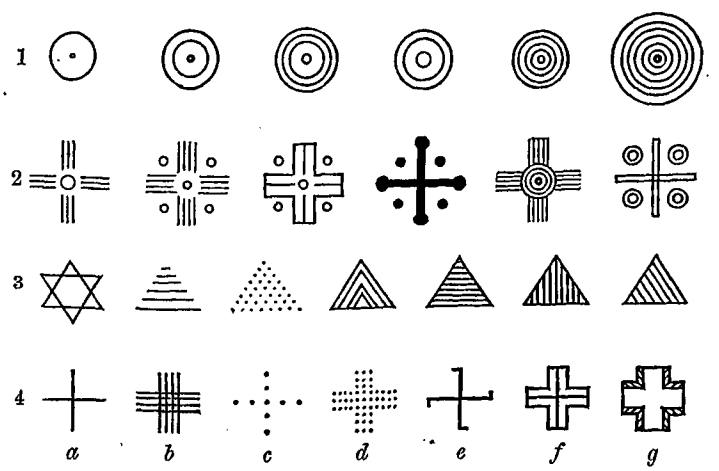


FIG. 146.—Designs of Bronze Age in France and Britain.

patterns of the Bronze age noted in France by M. Chantre: the whole of the first column and of the third,

[1] Tylor, *Primitive Culture*, ii. p. 151. Lubbock, *Origin of Civilisation*, p. 222. Elliot, *Journ. Ethnol. Soc. Lond.*, i. p. 94.

[2] *Archaic Sculpturings*, Edinburgh, 1867.

excepting 3 *a*, and 4 *a* and *c* of the fourth column, are characteristic of the Bronze age in Britain. The pottery is very generally ornamented with a pattern rudely impressed with a cord or twisted thong, or with the point of a stick.

France in the Bronze Age.

The new and higher civilisation introduced into Britain by the Celtic invaders gradually found its way into every part of the country, and the Neolithic manners and customs, such as the habit of burying the dead in caves or in large chambered tombs, became obsolete; the practice of inhumation, formerly invariable, was to a large extent supplanted by that of cremation, although both were carried on in the Bronze age simultaneously, as in Greece and ancient Italy. Before this new civilisation can be satisfactorily analysed, it will be necessary to examine the condition of France, Germany, and Scandinavia during the Bronze age, and to see how it is related to that of the Mediterranean peoples.

The numerous discoveries made in France and Switzerland during the last thirty years, recently collected together by M. Chantre,[1] prove that the divisions of the Bronze age, north of the Alps and west of the Rhine, are similar to those which we have noted in Britain. They are as follow:—

I. Transition de l'Age de la Pierre à l'Age du Bronze:
phase cébennienne = Epoque Morgienne of de Mortillet.

II. Age du Bronze proprement dit:
phase rhodanienne = Epoque Larnaudienne of de Mortillet.

[1] *L'Age du Bronze*, 3 vols. 4to, 1 vol. folio. Paris, 1877.

III. Transition de l'Age du Bronze à l'Age du Fer: phase moeringienne = Epoque Hallstatienne of de Mortillet.

The third of these we shall discuss in the chapter on the Iron age. The other two are the exact equivalents of those of Britain. The association in tombs and sepulchral caves of the ordinary Neolithic implements with bronze articles and with bronze ornaments, characterises the first of these divisions (see Table, p. 346), which is named from the great number of interments of this sort in the region of the Cévennes. In the Second or the Rhodanian age, named from the many discoveries in the valley of the Rhone, bronze is no longer rare, but it has become a necessary in every-day life, and smiths' shops have sprung up in various regions in which the broken implements and ornaments were worked up into new forms. These two subdivisions shade off one into another, and are not more clearly defined in France than in Britain.

The Age of Transition, or the Early Bronze Age.

If we examine the table of the contents of 147 chambered tombs in the Cévennes (p. 346), compiled from the work of M. Chantre, it will be observed that the principal difference between tombs of the Bronze and those of the Neolithic age consists in the addition of articles of bronze and glass. Daggers are comparatively abundant, lances are rare, and only one bronze axe of the simple wedge-shaped type is met with. All the bronze articles are small, and capable of being easily carried, and most of them are intended for personal ornament. Pins, bracelets, and rings are far more common than knives

daggers, or lances. The introduction of personal ornaments, and especially of glass, probably of Egyptian or Phœnician manufacture, before other articles, which may be presumed to have been used in the country where glass was manufactured, is what might have been anticipated from the past experience of the contact of peoples in different stages of civilisation. At the present time, the natives of Africa prefer articles which minister to their vanity to those of practical use, and glass beads are used as a medium of exchange by the traders, and pass from hand to hand into regions far beyond those into which our weapons and implements penetrate. This "period of transition" of M. Chantre is the necessary result of the intercourse of the inhabitants of France and Switzerland, at the close of the Neolithic age, with the civilised peoples south of the Alps, and it may be taken to be merely the first sign of their influence, subsequently to be felt in "the age of Bronze, properly so called."

From M. Chantre's observations it is evident that in France, as in Britain, cremation was practised side by side with inhumation.

The association of Neolithic implements with bronze articles is equally noticeable in some of the pile-dwellings of the Swiss and French lakes, and there is ample proof that the principal result of the introduction of bronze into those regions was the improvement of the civilisation which had existed long before.

The Late Age of Bronze in France and Switzerland.

The pile-dwellings of France and Switzerland, such more particularly as those in the lakes of Bourget,

Geneva, Neuchâtel, and Bienne, contain remains referred by MM. Chantre, de Mortillet, and others, to the late age of Bronze. An examination of the principal bronze implements, weapons, and ornaments, compiled from M. Chantre's tables, shows at once to what an extent the later age of bronze differs from the earlier. Various implements for casting bronze, and stamping it and working it in *repoussé*, are found with tools for working wood, reaping hooks, and swords, daggers, lances, arrow-heads, horse furniture, and personal ornaments; the whole forming a series of a totally different nature from that of the earlier period. Stone implements were, however, still in use, such as saws, wedges, scrapers, and, to a smaller degree, also axes. It may be objected to this collection of things found in and around the lake habitations, that it may be the result of the occupation of the same spots during many centuries, and that it does not necessarily follow that these articles are in any sense contemporaneous. A relic-bed may have been the result of accumulation during long periods of time. This objection will hold good in many cases but not in all, since the frequent conflagrations, by which the settlements were destroyed, would cause the heavy stone and bronze articles in use at the same time to drop to the bottom of the lake. According to Colonel Schwab,[1] about one quarter of the pile-dwellings in the lakes of Bienne and Neuchâtel were burned. It will not hold good in dealing with the "trésors" or hoards of bronze articles prepared for use, and concealed while being carried from one place to another, which have been met with in twenty-nine localities in France, nor will it apply to the sixty-seven hoards, in France and

[1] Keller, *Lake-Dwellings*, transl. by J. E. Lee, 2d edit. p. 672.

Switzerland, of broken implements and articles collected together for the purpose of being worked up by the bronze-smiths. In both these cases the articles were in use simultaneously, and their association offers us a standard of comparison by which the age of isolated finds may be ascertained.

In both these, as well as in the pile-dwellings of the early Bronze age, the plain wedge-axe is conspicuous by its absence, while all the other articles are of a higher and better kind than those which belong to that age.

Hoards of Bronze Merchandise.

The most important of the hoards of merchandise found in France is that discovered at Réallon, after a violent storm had devastated the district. The waters of a stream traversing a little village of that name had hollowed out a new channel for itself, and most of the antiquities were discovered by the villagers in the earth, deposited at a little distance away. They ultimately were purchased for the museum at St. Germain, together with those which M. Chantre was able to discover subsequently, representing altogether no less than 461 bronze articles, comprising knives, sickles, lance-heads, horse-bits, rings, buttons, pendants, and bracelets. With them were several small stone rings, a bead of amber, and two of blue glass. The position of Réallon is on a route which has been frequented for a long time, leading from the valley of the Durance to that of the Drac; and it was, M. Chantre remarks, probably that taken by travellers coming from primitive Etruria, from whom the inhabitants of the lake-dwellings "received beyond a doubt the

knowledge of bronze." The discovery, then, is of especial importance, because it represents the goods of a merchant selected to suit the market of the north and west. The abundance of personal ornaments in it corresponds with that abundance which has been observed in the sepulchres of the early division of the Bronze age. Several other similar discoveries are described by M. Chantre. That of Vaudrevanges, near Sarrelouis, contains, among other things, a sword which is identical with that described by M. le Comte Gozzadini from Ronzano, in Italy. The proportion of ornaments in these hoards is almost the same as in the sepulchres of the Cevennian or early Bronze age. In the one they amount to 75·02 per cent; in the other they are 79·87. The conclusion which we should draw from this fact is, that these articles were *en route* to be sold to those who ultimately deposited them, as their chief valuables, in the tombs.

Hoards of the Bronze-smith.

The deposits of fragments of metal, with the necessary implements for working it, in France and Switzerland, no less than sixty-seven in number, differ from those of merchandise, in the fact that the articles have been prepared for working up again. In the case of the former they are either worn out or broken, in the latter they are new and selected for the market. That discovered at Larnaud in 1865, in a potato ground near Lons-le-Saulnier (Jura), may be taken to illustrate the association of articles, amounting to 1485 pieces, intended to pass through the melting pot, and therefore imperfect, but affording a true idea of the art and civilisation in France at one and the same time. Among the materials for

smelting is a perfect ingot of bronze, weighing 2·840 kilos, boat-shaped, and perforated in the centre for convenience of carriage. Similar ingots have been met with in various parts of France, and are very readily mistaken for large and heavy hammers or picks. The tools for working bronze are represented in the following list:—

MATERIALS FOR SMELTING AND IMPLEMENTS FOR WORKING BRONZE.

Bronze ingot and fragments	24
Smelting waste	130
Mould of lance-head	1
File	1
Cold chisels and points	3
Stamps	2
A mould for making round heads in *repoussé*	1
Socketed hammer	1

The cold chisels are composed of bronze, with a large percentage of tin. The stamp is for working the plates of bronze, or possibly for making pottery or moulds. One is terminated by a disk, on which two circles are engraved round a central point. The other is a small elongated rectangular implement, with one end composed of a line of points and the other of a series of oblique lines. Both have evidently been employed in the composition of the beautiful patterns so conspicuous on the personal ornaments. We may therefore conclude that the manufacture of some of the higher works of art was carried on at this very spot.

The implements intended for various purposes are as follow:—

IMPLEMENTS FOR VARIOUS PURPOSES.

Socketed gouge	1
„ chisels	6
Flanged celts	7
Socketed celts	33
Palstaves	36
Unclassified celts	11
Sickles	51
Knife-blades	76
Razors	2
Socketed cutters	3
Tanged cutters	6
Hooks	6
Saws	5
Hand chisels	8
Points and drills	6
Nails and rivets	8
Strainer	1

Some of the socketed axes have rings on the same side as the cutting edge, and have been intended for adzes. The sickles and most of the knives have tangs, and the razors, with an open metal-work handle, are of the same type as those found in Italy, Switzerland, and Britain. Two knives have metal handles cast in one piece with the blade, and one is ornamented with a pattern in oblique lines, such as would be produced from a mould marked with one of the stamps found in the hoard.

The arms are represented in the following list:—

Swords or daggers	72
Scabbard ends and ferrules	16
Arrow-heads	18
Lance-heads	54
Ferrules for end of lance	51

The only perfect dagger-blade is one made out of a broken bracelet hammered out, with a characteristic

pattern on one side and the other perfectly smooth. A fragment of a round hilt has a large oval pommel, flat on the upper surface. The arrow-heads are thin triangular plates of bronze, generally with a tang, some hammered, others cast, and only one with a socket. A portion of a horse-bit was also discovered, and three fragments considered by de Mortillet to belong to a chariot.

The collection of ornaments, intended for the most part to be worn on the clothing, is of singular interest and beauty, and presents designs and shapes very widely distributed over Europe. The more important of them are given below.

PERSONAL ORNAMENTS.

Bracelets	214
Torques	32
Pins	61
Brooch	1
Disks made of wire twisted into a spiral	8
Pendants, chains, and rings	121
Appliqués or ornamental plates of bronze	57
Buttons	183
Ornamented Hooks	3
Clasps	30
Buckle	1
Round beads	60

The bracelets are either hollow or solid, of the split-ring type, round or flat in section. Some have their ends turned back after the manner of many of those found in Britain, Germany, and Denmark, and most are adorned with patterns of the kind figured above (Fig. 146, 1, 2, 3). One fragment,—a thin rod of bronze, strongly ribbed and twisted into the shape of a bow, with one end twisted so as to form a spring, and the other flattened to receive the pin,—presents us with the most

rudimentary form of brooch, or that of "the safety-pin." Five similar brooches have been discovered in lake-dwellings of the bronze age in Switzerland, and are to be seen in the museums of Berne, Zurich, and Bienne. Some of the clasps are highly ornamented, and present a pattern in waved lines and dots, which was widely spread throughout the Continent in the Bronze age. Simple torques with turned-up ends, and either twisted or adorned with chevrons, pins, various pendants, chains, and rings, complete the list of the more important ornaments.

Lake Dwellings of Late Bronze Age.

All the articles described in the preceding pages, from the hoards both of the merchant and the bronze-smith, occur in the lake-dwellings of France and Switzerland, assigned by M. Desor to "La Belle Age du Bronze en Suisse," and referred by M. Chantre to the Rhodanian age. They are found also in those considered by M. Chantre to belong to the transition of the age of Bronze to the age of Iron. Bronze swords occur at Moeringen,[1] with hilts inlaid with iron, side by side with bronze-hilted iron swords, and bronze bracelets inlaid with iron. This association of iron with bronze is particularly important, occurring as it does here in the middle of the characteristic ornaments and weapons of the late Bronze age. Other articles before unknown in France or Switzerland also appear along with the new metal; such, for example, as the peculiar brooch made of twisted wire, of the "safety pin" kind, so abundant in the Etruskan tombs of Bologna, and horses' bits also of Etruskan design.

[1] Keller, *Lake-Dwellings*, trans. by J. E. Lee. 2d vol. pl. xlix.

The designs found on the metal-work and on the pottery of the late Bronze age in Switzerland and in France are those represented in Fig. 146, p. 378. The cross is met with in dots or in right lines, and more rarely the interlaced triangles. The spiral is also seen, but it is by no means so common as in German and Scandinavian bronzes.

The pottery of the late Bronze age in France and Switzerland is far better than that of Britain, and bears obvious traces of foreign influence. Sometimes it is ornamented with the mæander pattern, or with the mystic fylfot (Fig. 146, 4 *e*). Sometimes it is inlaid with paper-like strips of tin.

The Bronze Age in Scandinavia.

The Bronze age in Scandinavia is divided into an early and a late period by Worsaae,[1] Montelius,[2] and other antiquaries. To the first belong the great stone-chambered tombs with many skeletons, containing bronze implements and weapons beautifully adorned with spirals and right lines. All have been cast, and the ornaments are never engraved on the metal. In the later period the tombs consist of small stone chambers with cinerary urns, cremation for the most part replacing inhumation. The ornaments are sometimes engraved

FIG. 147.
Diadem of Bronze, Denmark.

[1] Worsaae, *La Colonisation de la Russie et du Nord Scandinave*, transl. par G. Beauvois. Copenhague, 1875.

[2] Montelius, *Congr. Int. Archéol. Préhist.*, Stockholm vol., 1874, p. 488. *Antiquités Suédoises.*

or stamped in *repoussé*. Socketed celts make their appearance, and articles which, according to Montelius,

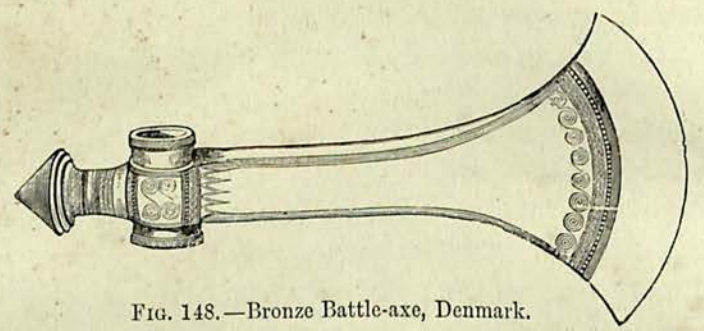


FIG. 148.—Bronze Battle-axe, Denmark.

have been derived from the south of Europe. Most, however, have been manufactured in Scandinavia.[1]

The extraordinary beauty of Scandinavian bronze ornaments and weapons may be gathered from the accompanying figures. Fig. 147 represents a diadem of bronze found in Denmark, showing the characteristic

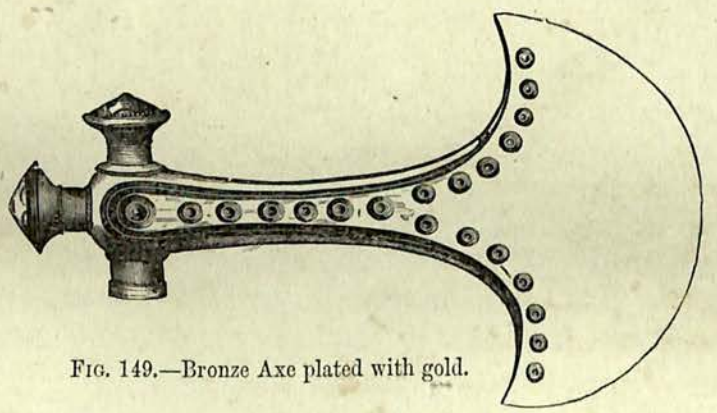


FIG. 149.—Bronze Axe plated with gold.

style of ornamentation; and Fig. 148 a bronze battle-axe fifteen inches in length and seven pounds in weight.

[1] For a list of articles of the Bronze age in Sweden, see Montelius, *Congr. Int. Archéol. Préhist.*, Stockholm vol., 1874, p. 510. Figs. 147 to 150, from Denmark, are borrowed from Worsaae, *Primeval Antiquities*, 8vo, transl. Thoms, 1849.

Axes, however, of this kind were not merely used in battle, but as insignia of rank. The original, for example, of Fig. 149 consists of a thin layer of bronze cast upon a nucleus of clay, sixteen inches long, and

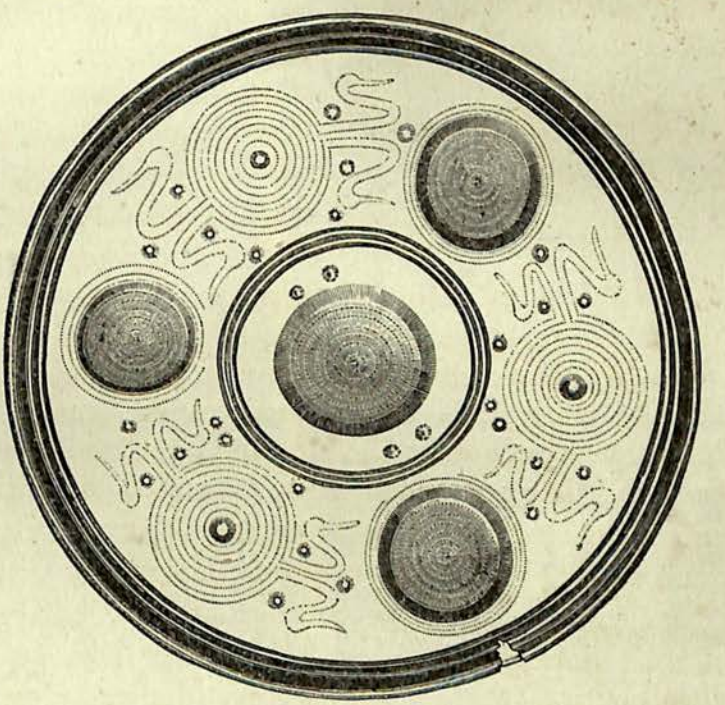


FIG. 150.—Bronze Shield in *repoussé*, Denmark.

covered with a thin plating of gold. It obviously could not have been used as a weapon. Shields also composed of thin plates of bronze with the edge turned over a thick bronze wire, such as Fig. 150, were used by the warriors.

Gold vessels and ornaments are met with, worked in *repoussé*, as in Fig. 151. The Bronze age in Scandinavia is remarkable not merely for the beauty of the workmanship, more especially of the hilts of the short leaf-shaped swords, but for the variety of weapons and orna-

ments. Many of these have been derived from more southern regions, and the evidence which they offer as to the overlapping of the Bronze and Iron ages in Europe, north of the Alps, is, as we shall see in the thirteenth chapter, of the very highest importance. The axes figured above are of the same pattern as those represented on the walls of the Etruskan tomb at Cære, and are altogether unlike any axes of the Bronze age either of France or of Britain. They belong to the Iron age of Italy.

FIG. 151.—Gold Cup, Denmark.

In the classification of the Scandinavian antiquaries inhumation is supposed to mark a higher antiquity than cremation. It seems more probable from the associated works of art that the two were practised during the later Bronze age. In the tomb of Jaegersborg,[1] near Copenhagen, a bronze shield was found ornamented with gold leaf, worked in *repoussé*, and of the same style as the golden articles to be described presently, belonging to the late Celtic or Prehistoric Iron age in Britain, and to the early Etruskan age of Hallstadt.

Sculptures of the Bronze Age in Scandinavia.

The sculptures on the glacier-worn rocks of Sweden, and on some of the tombs described by Montelius,[2]

[1] Engelhardt, *Guide Illustré du Mus. des Antiq. du Nord à Copenhague*, 2d edit. p. 10.

[2] *Congr. Int. Archéol. Préhist.*, Stockholm vol., p. 453 *et seq.*

Bruzelius,[1] Nilsson,[2] and Holmberg,[3] convey to us a vivid idea of the life of the people in the north of Europe in the Bronze age. In Fig. 152 we see a human figure represented, armed with a bronze axe. In some groups the characteristic stone axe-hammer with its handle is to be seen; in others the small-handled short sword, and the round buckler. Some of the figures of the warriors are larger than life-size. The sculptured rock at Tegneby,[1] figured below (Fig. 153), may be taken as an example of some of the groups. In the upper part domestic oxen are represented with their driver, and a man is ploughing with a yoke of oxen. An archer is shooting, and down below a party of four men, armed with round shields and axes, are fighting. Boats also are represented, some of them drawn up in line, and one in front with a covered stern possesses an awning. On a rock in the same place a group of warriors is seen on horseback contending with spears, and

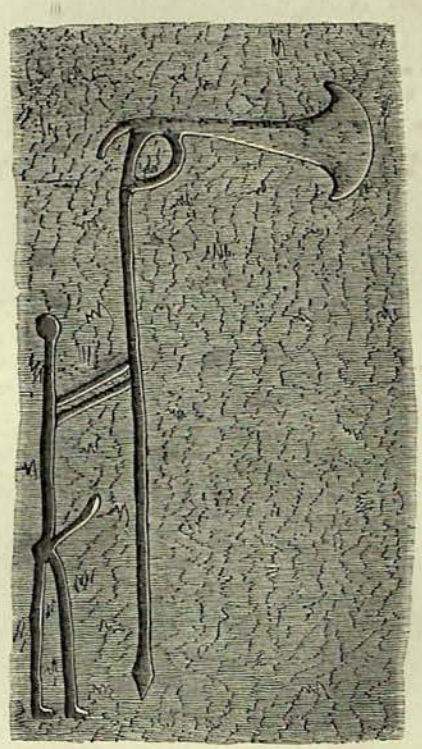


FIG. 152.—Man with Bronze Axe on a rock at Simrislund, Scania.

[1] *Congr. Int. Archéol. Préhist.*, Stockholm vol., p. 453 *et seq.*

[2] *Die Ureinwohner des Scandinavischen Nordens.* Hamburg, 1863, p. 9.

[3] *Scandinaviens Hällsristning ar Arkeologisk Afhandling*, 4to, 1848.

armed with oblong shields. This may be claimed as the

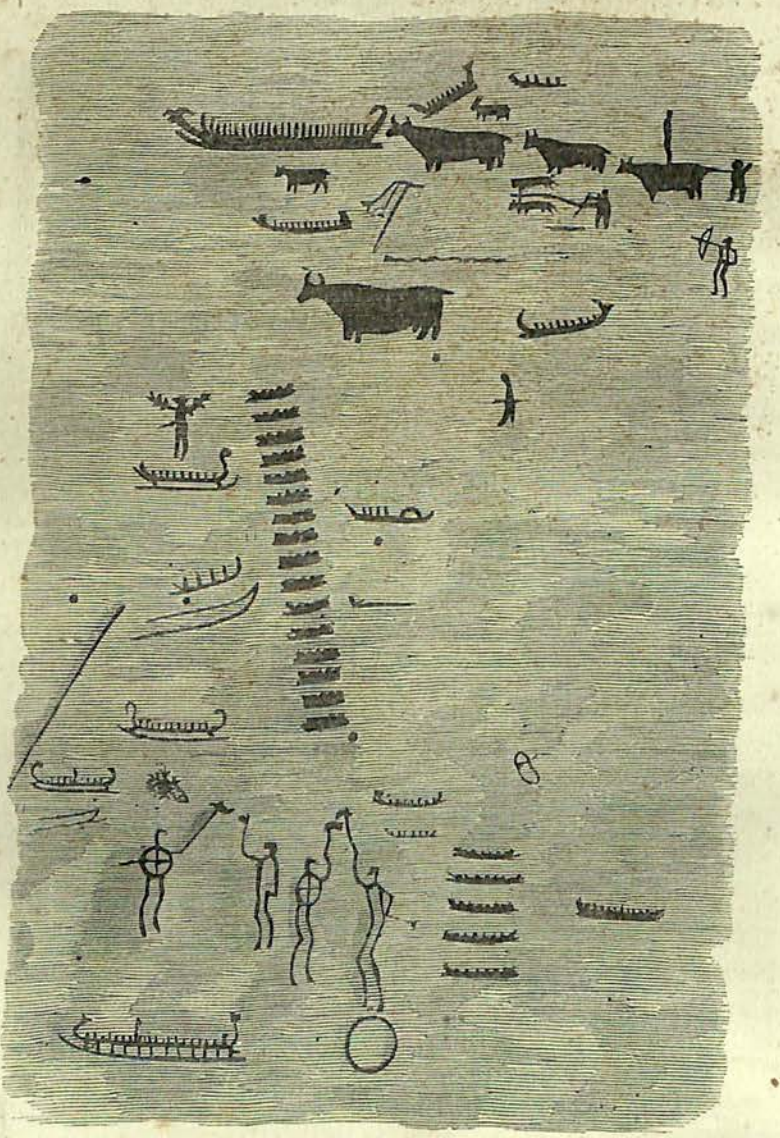


FIG. 153.—Sculptured Rock at Tegneby, Bohuslän.

earliest example of the horse being used for riding in northern Europe.

In the sculptured slab in the tomb of Kivik, in Scania, a pair of horses is drawing a chariot of the rudest construction, on which stands the driver (Fig. 154). In the left-hand upper corner is an armed man with three captives, and at the bottom a row of eight draped figures, with a man in front of them. On another slab in the same tomb these figures are repeated; the armed man is present with his three captives, and a second also with three, and the draped figures are arranged four on each side of what appears to be an altar; while a row of men are represented above, three blowing the large curved horns of bronze, which have been repeatedly found in Scandinavia. In the same tomb boats of the kind figured above, and two crescents with scrolls of late Celtic design, are also represented; and two axes on each side of a cone, of the type figured above (Fig. 148), prove that the whole set belong to the late Bronze age in Scandinavia, or the Iron age of Italy, France, and Britain.

FIG. 154.—Engraved Slab Tomb, Kivik, Scania.

The boats have highly ornamental ends, and are

propelled by broad paddles; in one the men are keeping stroke, and the master in the prow of the boat is directing them. Sometimes, though rarely, they carry one mast with sails, as in the slab at Järrestad, figured by M. Bruzelius. Long galleys similar to those engraved on the rocks, with prows and sterns lifted high up above the water, like those above described, frequently adorn the blades of razors and other articles of the Bronze age in Scandinavia.

From these figures we may conclude that the Scandinavian peoples in the Bronze age were possessed of boats, very different from the rude Neolithic canoes, and capable of taking long voyages. It is very likely that these boats are to be looked upon as the precursors of the long ships, snakes, and sea-dragons, which carried the terror of the northern pirates into almost every portion of the seaboard of Europe. They imply a considerable amount of intercourse by sea between Scandinavia and the adjoining countries.

General Conclusions.

From the facts recorded in this chapter it is obvious that the civilisation of Britain in the Bronze age was closely related to that of the Continent, and that it was far higher than that which it succeeded. It was, however, of a lower order than that either of Scandinavia or of France, which is a fact due to the Bronze age of the former having lasted as late as the Christian era, while the latter country was the first to receive advantage from intercourse with the civilised peoples south of the Alps. The origin of bronze, and of the bronze civilisation, will be treated in the following chapter.

CHAPTER XI.

THE INTRODUCTION OF BRONZE, AND OF THE BRONZE CIVILISATION, INTO EUROPE.

No Copper Age in Europe.—Copper Mines worked in Britain and Spain in the Bronze Age.—Tin-stone often associated with Gold.—Tin in Scandinavia, Germany, and Britain.—Tin Mines worked in France and Spain in the Bronze Age.—Tin Mines in Tuscany worked by the Etruskans.—Probable Sources of Assyrian and Egyptian Tin.—Bronze introduced into Europe from one Centre.—Knowledge of Bronze derived from Asia Minor.—The Early Bronze Implements in Europe.—The Development of the Bronze Industry in the late Bronze Age.—Local Centres of Bronze Industry in the late Bronze Age.—Distribution of Gold in Europe.—Distribution of Amber in Europe.—The Duration of the Bronze Age north of the Alps.—Commercial Relations of Britain in the Bronze Age.

No Copper Age in Europe.

CUTTING implements of bronze gradually supplanted those of stone, not only in the area north of the Alps and Pyrenees, but also, as is proved by many discoveries, in Greece and Italy, without any sign of an intervening period when copper alone was used. Copper celts have been met with in Ireland, Hungary, and France, but most of them belong to well-known and highly-advanced types in bronze, and more particularly so in Hungary.[1]

[1] Among those from Hungary are socketed celts, and perforated axes and axe-hammers.—See Pulszky, *Congr. Int. Archéol. Préhist.*, Buda-Pesth vol., 1877, p. 220.

They were probably the result of the want of tin necessary for the manufacture of bronze. Copper by itself would not be very much more useful for cutting purposes than stone, on account of its softness, and therefore is not likely to have superseded stone, which is so much more widely spread, and to the use of which mankind had been accustomed for many centuries. The native copper of Lake Superior has been worked by the Red Indians from an unknown period; and had it offered them a material much better than stone, there would have been an age of Copper in North America. The few implements of that metal which have been discovered do not afford any evidence of this. At the time of the discovery of the New World the peoples of Peru and Mexico used bronze, while the ruder American tribes were in the Neolithic stage of culture. It is therefore improbable that copper should have marked a stage in human progress in Europe, where native copper is so rare, and where the ores would have to be reduced to obtain the metal. The appearance of a definite compound such as bronze implies that it has been introduced into Europe from some other area, in which we may suppose that the ingenuity of man was at work for a long period in finding out, by continual experiments, the properties both of copper and of tin, ultimately combining them together in the proportions which are so generally observed in the implements and weapons of the Bronze age. There is no trace of any such series of experiments having been carried out in Europe.[1] The origin of bronze, and the source from which bronze was

[1] General Lane Fox thinks it probable that there was a Copper age in Europe, and accounts for the scarcity of the implements by the hypothesis

introduced into Europe, can only be discussed after we have treated of the distribution of copper and of tin.

The Distribution of Copper Ores.

Copper is supposed by Pliny to have derived its name from Cyprus,[1] where it is said to have been first mined, and whence the Romans obtained the greater part of their supply (*æs Cyprium*). It is to be found in nearly every country in Europe, and it must have attracted attention in the earliest ages, from the beautiful green, blue, and red colours of its ores. In Britain it occurs in many places; in Cornwall, Devon, and Somerset, in Derbyshire and Cheshire, in Yorkshire, Cumberland, Westmoreland, and in Wales.

It has been worked in this country in very remote times. The Hon. W. Owen Stanley[2] records the discovery of "two mining tools or picks" in an old mine near Llandudno, in North Wales, along with stone hammers made of large rounded pebbles, with grooves cut round them for the reception of a handle of osier.

that they have been used up in subsequent ages for the manufacture of bronze. (*Primitive Warfare*, Journ. United Service Inst. xiii.)

Mr. Evans holds the view expressed in the text, *Congr. Int. Préhist. Archéol.*, Buda-Pesth vol., 1877, p. 234.

[1] It is quite as likely that Cyprus may have been derived from copper, and it is very improbable that the German Kupfer is derived from Cyprus. The Germanic peoples were acquainted with copper long before they were brought within reach of the Mediterranean civilisation, probably while they were yet in Central Asia. Pliny's derivation is probably merely suggested by the resemblance between the words copper and Cyprus, which may be as misleading as that of the town of Bridgewater, from the bridge over the water (the Parrett), instead of from Burgh and Walter, the burg of Walter, Walter de Burgh.

[2] *Archæol. Journ.* vii. 68.

A second instance of the discovery of old tools in British copper mines is offered by the surface workings at Alderley Edge,[1] near Manchester, from which I obtained in 1874 many stone hammers of the same kind as those mentioned above, along with stone wedges. Similar instruments occur in the copper mines in Spain.[2] In those at Cordova flint implements, and picks made of stags' antler, have been met with, resembling those found in the Neolithic flint mines of Cissbury and Brandon, as well as stone hammers of the kind found in Britain. We may therefore conclude that copper was worked in Spain and Britain, and probably also in many other countries on the Continent, as far back as the Bronze age. When once the art of reducing the ores became known, they would be worked wherever they were discovered. It is interesting to remark that the hammers found in the European mines are of the same form as those used by the Red Indians in working the native copper of Lake Superior.

Tin-stone frequently associated with Gold.

The tin-stone (oxide of tin) or cassiterite is not conspicuous, like copper, for its brilliancy of colour, being brown, yellowish-green, sometimes opaque and sometimes transparent, and it is remarkably limited in its distribution in Europe. It occurs in the granitic and highly altered crystalline rocks, in veins disseminated through the mass; or where the rocks have been worn away by frost, rain, and rivers, it is found in irregular

[1] *Journ. Anthrop. Inst.* v. p. 1.

[2] *Matériaux*, 1867, p. 100. Simonin, *La Vie Souterraine*, p. 481 (Fig. 132).

lumps and grains, scattered through the loam, sand, and gravel which constitute the stream-works. It is readily recognised by its great weight. Very frequently it is found along with gold in the stream-works, and to this association is probably due its early discovery by man. Gold, from its brilliant colour and indestructibility, must have been the first metal to catch the eye of man, and when it was once sought by the simple process of washing, the heavy tin-stone would be left behind along with it. In the course of time the true nature of tin-stone was probably revealed by accident, and before the eye of the astonished beholder the dull stone flung into the fire became transfigured into the glittering metal. The ease with which this can be done with the rudest appliances is shown by the processes which Mr. J. A. Phillips observed in 1856, at Zamora in Spain, and which are probably a survival into our own times of the most ancient mode of reducing the ore.[1]

[1] This account, which has been prepared for me by the kindness of Mr. J. A. Phillips, forms an interesting contribution to the history of metallurgy.—

"In the year 1856 I visited the province of Zamora, where, in a hamlet near San Martin, I met with a family occupied in treating tin-ores on their own account.

"The children, of whom there were several, collected rich shode stones of tin-oxide from the surface of neighbouring ploughed fields, and brought them in a reed-basket to a rough open shed or hovel; here they were broken with a hammer upon a big stone, and the extraneous matter was roughly picked out.

"The furnace, which was lined with clay resulting from the decomposition of granite, was a cylinder ten inches in diameter, and about two feet in depth, situated in the middle of a cubic yard of rough masonry constructed without mortar.

"In the centre of the top of this was the opening of the furnace, and on the side towards the prevailing wind a screen of masonry was built to

Tin, like copper, from its softness, is unfitted for cutting purposes, and therefore does not mark an era in the civilisation of the world. It was used in the Bronze age unalloyed, merely for purposes of ornament, and for inlaying pottery, such as that discovered in the pile-dwellings of the lake of Bourget.[1]

Tin in Scandinavia, Germany, and Britain.

In our enquiry into the origin of the Bronze civilisation, it is unnecessary to notice the tin districts of Sweden and Finland, which have only been worked in modern times.

In Germany tin has been worked from time im-

the height of some two feet; so that, externally, the apparatus was not unlike a large chair built solid to the seat, enclosing a chimney-pot extending from the middle of it nearly to the floor-level. A blast was employed, produced by an old pair of weezy blacksmith's bellows, apparently of English make, placed behind the screen of masonry, the tuyère being inserted about four inches above the bottom. The tap-hole, which was on the opposite side, was kept constantly open.

"In order to carry on the operation of smelting, the ore which had been collected by the smaller children, and had subsequently been broken and roughly picked over by a bigger brother, was finally charged into the furnace, alternately with handfuls of fuel, by the mother, while the father blew the bellows. Charcoal made from the roots of a species of heath, locally plentiful, was employed as fuel, no flux of any kind was used, and the metal and slag issuing from the open tap-hole were received in a fragment of a broken cast-iron pot. A very small quantity only of slag was produced, which, falling from time to time into the broken pot with the metal, was, as it set, removed with an iron crook.

"When a sufficient quantity of tin had accumulated in the broken pot, it was cast into strips in a sandstone mould.

"The quantity produced did not exceed a few pounds per hour, and I was informed that after being cast into strips it was usually sold to travelling tinkers for the purpose of tinning copper vessels."

[1] Chantre, *L'Age du Bronze.*

memorial in the mountains of Saxony and Bohemia, and, from the great number and variety of the bronze articles found in the adjacent regions, it is very probable that it was known in those districts in the Bronze age. On this point, however, we must await the accumulation of new evidence. It has been worked in Cornwall before the history of Britain began, and, according to tradition, by the Phœnicians. Cornwall was certainly known to the Phœnician sailors, as we shall see presently, and from it a brisk trade was carried on with the great Greek mart of Massilia.[1] It is considered by some high authorities, including Sir John Lubbock,[2] to have been the chief source from which the ancients obtained a necessary element in the manufacture of bronze. This question will be dealt with subsequently. Tin has also been worked in ancient times in the south of Ireland, where it is found in the stream-works of the mountains of Wicklow, along with gold. (See Fig. 168, T.)

Tin Mines worked in France and Spain in the Bronze Age.

Tin is met with in Brittany, close to Ploermel (Morbihan), and is proved to have been worked in the Bronze age by the discovery of a bronze palstave (Fig. 155), along with a polished stone celt, in the old stream-works near Villeder.[3] It was also known in ancient times in the Upper Vienne, and old stream-works are to be seen in La Creuse and La Corrèze, and as far as Lizolle in the department of the Allier.[4] (See Fig.

[1] See Chapter XIII. [2] *Prehistoric Times*, 4th ed. p. 72.
[3] Simonin, *La Vie Souterraine*, Paris, 1867, p. 483.
[4] Daubrée, *Compt. Rend.* lxviii. p. 1137. *Matériaux*, 1869, p. 261.

168, T.) According to M. de Mortillet, the Cassiterides[1] of the ancients are to be sought rather in the islands off

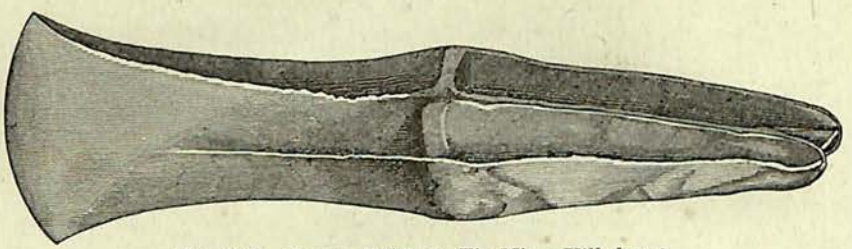


FIG. 155.—Bronze Palstave, Tin Mine, Villeder, ¾.

the coast of Brittany than in the Scilly Isles, in Cornwall, or on the west of the Iberian peninsula.

The Iberian peninsula was undoubtedly, as Mr. Howorth[2] points out, one of the chief centres from which the civilised peoples of the Mediterranean were supplied with tin. Pliny[3] tells us that tin-stone is associated with gold in the stream-working of Galicia. It may have been sought in the Bronze age in the province of Asturias, since primitive tools are discovered in the old workings.[4] It is picked up at the present day, by the children in the fields, in the valley of the Douro, and reduced by the peasants in the simple manner recorded above. It abounds also in Portugal, in the neighbourhood of Bragança, and in other localities. (Fig. 168, T.)

[1] Those who are interested in the vexed question of the Cassiterides, will find it ably discussed by M. Hans Hildebrand (*Congr. Int. Archéol. Préhist.*, Stockholm vol., p. 578. He follows Strabo in placing them in the west of Spain.

[2] Howorth, *Archæology of Bronze.* [3] xxxiv. 47.

[4] Busk, *Int. Congress Archeol. Prehist.*, Norwich vol., p. 163.

Tin Mines of Tuscany worked by Etruskans.

The last and one of the most important discoveries of ancient tin mines in Europe is that brought before the Archæological Congress at Buda-Pesth, by Prof. Capellini[1] in 1876. The mines in Tuscany (Fig. 168, T) in Monte Valerio, opposite the island of Elba, called Cento Camerelle, have long been known for their enormous depth and their vast extent, and are proved by the implements and scarabæi found in them and the surrounding refuse-heaps to have been worked by the Etruskans. In exploring one of the galleries M. Blanchard discovered tin-stone, which had evidently been the principal metal sought by the miners.[2] Tin-stone also occurs in small quantities in the neighbouring island of Elba.

Monte Valerio is not very far from the copper mines of Montieri (Lat. *Mons aeris* = Bronze Hill), a name which stamps the locality where the copper and tin were mingled together by the smelter. The copper mines were worked with bronze picks and wedges, and in the refuse-heaps vast quantities of pottery have been found with some coins, among which is one of Populonia (Pupluna) with the head of Vulcan, and on the reverse the emblems of the metal-worker—a hammer and pincers.[3] Thus, in this district, close to the centre of the dominion of ancient Etruria, we have the two metals side by side, which enabled the Etruskans to become the famous bronze merchants and metal-workers which they were at

[1] *Congr. Int. Archéol. Préhist.*, Buda-Pesth vol., p. 452.

[2] Mr. A. E. Arnold has recently given an interesting account of these mines ; *Iron*, Aug. 9, 1879, p. 166.

[3] Simonin, *La Vie Souterraine*, Paris, 1867, p. 474 *et seq.*

the dawn of history in Italy. There is no longer any reason for supposing that the civilised Mediterranean peoples were dependent on the mines of Spain and Britain for a supply of bronze. We have also explained to us one of the causes of the wealth of the Etruskans. Bronze must have been almost as valuable and quite as beautiful as gold, and the most useful material for making implements and weapons before the invention of iron. The commerce, therefore, of the Mediterranean world would inevitably be attracted to Tuscany, and the products of the industries of Egypt, Assyria, and Greece would be received in exchange for the bronze articles for which the Etruskans became so famous. By this discovery tin and copper are proved to occur in the very region where they might reasonably be expected.

It is very probable that the oldest tin mines worked in Europe are those of Tuscany. Then the natural progress of discovery would lead the Phœnicians to the exploration of the tin mines of the Eldorado of the West—the Iberian peninsula. And next, as the adventurous sailors penetrated farther to the north, along the shores of the ocean, the mines of Brittany and Cornwall would be opened up. Those of Saxony and Bohemia and of central France were probably developed, the one by the energy of the Etruskan merchants, and the other by the merchants of Massilia, or of the Phœnician Heraklea; but they may have been worked by the natives before the paths of commerce reached so far north. In France the mines of Villeder were worked in the Bronze age.

None of these districts can lay claim to be the centre in which tin was first worked and bronze was discovered. The origin of bronze, like that of the use of polished stone, has to be looked for in some other region.

Probable Sources of Egyptian and Assyrian Tin.

There is no reason to suppose that the civilised peoples of the eastern Mediterranean were dependent upon the mines of Europe for their tin. Major Burton has lately proved the existence of vast heaps of cinders, and other proofs of mining and smelting, in the land of Midian. From these mines it is very likely that the metals were obtained—"the gold, and the silver, the brass (probably bronze), the tin, and the lead,"[1]—taken by the children of Israel from the Midianites at the close of the life of Moses. Tin is also found, according to Von Baer,[2] in Khorassan, as well as copper and lead. It is far more probable that Assyria and Egypt were supplied with tin from these two regions, than from the mines of the far west of Europe, or from the remote tin regions of the far east, from Malacca and the Island of Banca.

The Metallurgy of Bronze.

There is no reason to suppose that the art of mixing tin with copper was discovered in Europe, and in this manner of producing an alloy more fusible than copper and harder than either of its constituents. From Dr. Robinson's experience[3] it appears that twelve per cent of tin gives the greatest amount of hardness to bronze, consistent with toughness, while a larger percentage increases the hardness until the bronze becomes almost as brittle as glass. It is therefore very interesting to remark that

[1] Numbers xxxii. 22.

[2] *Archiv für Anthrop.* 1877, i. 9. *Matériaux*, 1877, p. 138.

[3] For details and references see Wilson, *Prehistoric Annals of Scotland*, i. part ii. chap. 3.

the percentage of tin in the bronze articles belonging to the Bronze age is as nearly as possible that which is the best for making a compound for cutting purposes, from ten to twelve per cent. It will be seen from the following table that there is but little variation in the proportions of tin, and not more than might be expected from the rough and inaccurate modes of mixing the metals before the invention of a definite system of weights.

ANALYSIS OF BRITISH BRONZE ARTICLES OF BRONZE AGE.[1]

NAME.	LOCALITY.	Copper.	Tin.	Lead.	Zinc.	Iron.	Arsenic.	Sulphur.
Lituus (Wilson) . . .	Lincolnshire .	88·	12·					
Simple Wedge Celt (Wilson)	Ireland . . .	94·	5·09			0·01		
Palstave (Wilson) . .	Cumberland .	91·11	9·					
Palstave (Wilson) . .	Fifeshire . .	81·19	18·31	0·75				
Palstave	Fifeshire . .	89·33	9·19			0·33		0·24
Socketed Celt (Phillips)	Ireland . . .	90·68	7·43	1·28	—	tr.	—	—
Spear-head ? Dagger (Phillips)	Ireland . . .	99·71	—	—	—	—	—	0·28
Dagger (Wilson) . . .	Ireland . . .	90·72	8·25	0·87	—	—	—	—
Sword-handle (Wilson)	Ireland . . .	87·07	8·52	3·37	—	—	—	—
Sword (Wilson) . . .	Ireland . . .	87·94	11·35	0·28	—	—	—	—
Spear-head (Wilson) .	Ireland . . .	84·69	14·01	—	—	—	—	—
Spear-head (Wilson) .	Ireland . . .	86·28	12·74	0·07	0·31	—	—	—
Scabbard (Wilson) . .	Lincolnshire .	90·	10·	—	—	—	—	—
Sword (Wilson) . . .	Ireland . . .	83·50	5·15	8·35	—	—	—	—
Sword (Wilson) . . .	Ireland . . .	88·63	8·54	2·83	—	—	—	—
Sword (Phillips) . . .	—	91·79	8·17	—	—	tr.	—	tr.
Sword (Phillips) . . .	Ireland . . .	85·62	10·02	—	—	0·44	—	—
Sword (Wilson) . . .	Thames . .	89·69	9·50	—	—	0·33	—	—
Sword (Wilson) . . .	Duddingstone	88·51	9·30	2·30	—	—	—	—

[1] Wilson, *Prehistoric Annals of Scotland*, i. p. 374; Second Edition. Phillips, *Journ. Chemical Soc.*, iv. p. 288.

ANALYSIS OF FRENCH BRONZE ARTICLES OF BRONZE AGE.[1]

NAME.	LOCALITY.	Copper.	Tin.	Lead.	Zinc.	Iron.	Arsenic.	Sulphur.
Palstave . . .	Rhone	85·	13·5	1·0				
Palstave . . .	Hoard of Poype-Vauqris	88·	12·0	—	—			
Palstave . . .	Hoard of Poype-Vauqris	91·	9·					
	Hoard of Larnaud . .	86·	14·					
Socketed Celt .	Copenhagen	89·52	6·75	2·90	0·91	tr.		
Round Socketed Celt	Ille-et-Vilaine . . .	70·	21·5	8·50	—	—		
Round Socketed Celt	Manche	60·	13·50	16·50	—	—		
Square Socketed Celt	Normandy	62·	1·50	32·5	—	—		
Square Socketed Celt	Normandy	68·	tr.	28·50	—	—		
Sickle	Hoard of Drumettaz Plafond	88·7	11·3					
Sickle	Hoard of Poype-Vauqris	86·	14·					
Knife	Pile-dwelling, Bourget .	85·	15·	1·0	—	—		
Open Bracelet .	Hoard of Poype-Vauqris	88·	12·					
Button . . .	Hoard of Larnaud . .	100·	—	—	—	—		
Pin	Bourget	88·	12·					
Pin	Drumettaz Plafond . .	88·	10·	—	2·0			
Anvil	Geneva	84·	16·					

[1] Chantre, *L'Age du Bronze.*

The presence of lead, and of iron, zinc, sulphur, silver, and nickel, in extremely small quantities, is probably due to their not having been separated from the copper in the operation of smelting. In some cases, however, such as the socketed celts from northern France in the above table, the percentage of lead is too great to have been accidental, and in one case rises to 28·50, while tin is reduced to a mere trace. Lead would add to the toughness of the alloy, and may have been used where the supply of tin had run short. In anvils and cold chisels, where great hardness was required, the normal amount of tin was very much exceeded.

It may be gathered from the analyses of ancient

bronzes made by Phillips,[1] and subsequently carried on by Von Bibra,[2] and Von Fellenberg,[3] that the oldest (see the above tables) were composed essentially of tin and copper. Subsequently lead was added in the coinage (*æs, semis, quadrans*) of the Republic, and in the Greek coinage after B.C. 400. "Zinc makes its appearance a short time previous to the Christian era, and is continued in all the subsequent coins, although "occasionally associated with lead and tin, until it almost entirely disappears in the small brass of the period of the Thirty Tyrants."[1] Bronze therefore is more ancient than brass, and the terms æs, χαλκός, and "brass" in the Bible, imply the former and not the latter alloy. The shield of Achilles was made by Hephaistus, of copper, tin, gold, and silver mingled together in the furnace. The oldest seats of bronze-founding among the Greeks were Delos, Ægina, and Corinth.

Bronze introduced into Europe from one Centre.

The uniformity of the composition of the cutting implements of the Bronze age implies that the art of compounding tin with copper was discovered in one place, from which the knowledge of it spread over nearly the whole of Europe and Asia, and the greater part of the Americas. Had it spread from separate centres, this uniformity would have been impossible. The bronze implements of ancient Peru and Mexico, although separated by such a vast distance from the parts of Asia

[1] Phillips, *Journ. Chem. Soc.*, iv. p. 288.

[2] Von Bibra, *Die Bronzen und Kupferlegirungen der Alten und Ältesten Völker*, Erlang. 1869.

[3] Von Fellenberg, *Trans. Nat. Hist. Berne*, 1860-61.

formerly inhabited by the bronze-using peoples, have probably been introduced from that region by Mongolian tribes, along with some of the symbols in the Mongolian Calendar, and other proofs of their Asiatic origin.[1] The variations from the normal alloy, which led Prof. Wilson to conclude that bronze was invented in many isolated centres, are easily accounted for either by imperfection in the smelting, or by the stock of tin of the bronze-founder having been exhausted. They would inevitably result from the establishment of bronze-smiths' shops in various countries, in which broken implements, weapons, and ornaments, were made into new articles. The nickel in the bronzes from western Switzerland is considered by Von Fellenberg[2] to have been derived from the nickeliferous copper ores of the Valais, which were mixed with tin imported from abroad. There is, as we have seen, no evidence that bronze was originally invented in Europe, and the only clue to its origin is offered by the forms of the simple implements and weapons which were the first to arrive in Europe in the early Bronze age.

The numerous discoveries of the last thirty years show that while certain articles, such as the plain wedge-axe, the dagger, and the sword with a flat metal tang for the reception of plates of horn or of wood, are found in Italy, France, Britain, Scandinavia, and Germany, as well as Egypt, and while there is a general likeness between the series of implements and weapons in various European countries, there are other articles, such as brooches and swords with metal hilts, peculiar to certain districts.

[1] On this question see *Edinburgh Review*, October 1876, p. 283; Bancroft, *Native Races of the Pacific States*, vols. i. and iv. Prescott, *Conquest of Mexico*, p. 466.

[2] Keller, *Lake-Dwellings*, 2d edit., p. 557.

From this it may be inferred that the supply of bronze was obtained from some one centre, and that afterwards articles were manufactured with various local modifications of the original models. These would be very easily produced, from the readiness with which moulds could be made in soft materials, such as clay and sand. In this manner the resemblances and the differences between the European bronzes may be satisfactorily explained.

Knowledge of Bronze derived from Asia Minor.

The observations of Worsaae[1] on the colonisation of Russia and North Scandinavia,[2] and the recent work of Kohn and Mehlis,[3] prove that the bronzes of Germany, Scandinavia, western Europe, and the Mediterranean, are not derived from the great plains of Russia, extending to the Urals and the Caucasus, since the bronze implements in those districts are unlike those of the rest of Europe, and are to a large extent of a later date. The only other region from which bronze could have been derived is Asia Minor. In Worsaae's opinion it was introduced by way of the Bosphorus. It was probably discovered in some metalliferous region in central Asia, from which it was distributed by means of barter, as well as by the migrations of peoples, from such a centre, for example, as Khorasan, mentioned in treating of the distribution of tin. If this view be accepted, it will follow that bronze was used in the south long before it was known in the north of Europe; and the

[1] Keller, *Lake-Dwellings*, 2d. edit., p. 557.

[2] *Sur la Colonisation de la Russie, et du Nord Scandinave*, 8vo.

[3] *Vorgeschichte des Menschen in östlichen Europa*, Jena, 1879.

greater part of the Continent may have been in the Bronze age while Egypt and Assyria were in that of Iron.

The Earliest Bronze Implements in Europe.

The bronze articles which are most widely distributed are the simple wedge-shaped axe, and the simple dagger. These are found in Egypt, in the ruins of Hissarlik, in the island of Termia, in Cyprus, and over the whole of Europe as far north as Sweden. The wedge-axe is found in India (Gungeria), in Mexico, and Peru. These two forms appear together in the early Bronze age of Scandinavia, Britain, and France, and they are therefore probably the first metal implements which found their way into the hands of the Neolithic inhabitants of Europe. The history of their evolution is the same; just as the wedge axe is the descendant from a prototype of polished stone, so is the dagger related to that of stone, of which so many wonderfully worked examples have been found in Scandinavia, and which have also been discovered in Egypt. One specimen from the latter country, in the British Museum, is mounted in a wooden handle, like those of bronze. Swords and more complicated axes, and more elaborate articles, came in afterwards, and present local peculiarities which enable the archæologists to map out Europe into different regions characterised by the different styles.

Development of the Bronze Industry.

Bronze was introduced into Europe first of all in the shape of simple implements, weapons, and ornaments, and afterwards, when smelting became known, ingots of

bronze were current as the bullion of those times, capable of being used either for manufacture or for commerce. These have been found in France, Germany, and Scandinavia. The idea of coinage probably originated in this way, and the "*æs rude*" of the Etruskans passed into the "*æs signatum*" of a definite shape, weight, and value. The merchant with his pack was followed by the smelter with his tools, and as trade increased local centres of manufacture would be set up, where the conditions were favourable. In the course of time the original models would be concealed by the development of a local style. This local development of manufactures would not prevent the importation from time to time of foreign articles, such as the Etruskan shields, swords, and golden cups discovered in Scandinavia. In this manner the association of articles imported from abroad with those made upon the spot may be accounted for. The smelter was succeeded by the tinker and the worker in *repoussé*, who penetrated into the regions north of the Alps from the Mediterranean area towards the close of the Bronze age in those regions, if not before.[1]

Local Centres of Bronze Industry in late Bronze Age.

The forms of the implements and weapons, and the variations in the style of ornament, enable us to divide the Europe of the late Bronze age into three great regions, each possessing its own peculiarities—the Uralian or the Russian in the east; the Danubian in northern and middle Europe; and the Mediterranean in the south. The first of these stands so completely apart from the others, that

[1] Montelius, *Sur l'Age du Bronze en Suede*, Congr. Int. Archéol. Préhist. Stockholm vol., 1874, 488. Chantre, *L'Age du Bronze*, ii.

it is important for our enquiry only because it proves that the civilisation of the Bronze age was not derived from central or southern Russia. The Danubian is further subdivided by M. Chantre into two closely connected provinces, the Scandinavian and the Hungarian. The Scandinavian bronze swords,[1] with metal hilts elaborately adorned with spirals and chevrons, are so closely allied in their style to those of the Hungarian province, that it is very probable that their designs were originally obtained, as well as the metal, from that quarter. The third group consists of the provinces of Greece, Italy, and France and Switzerland. Into the last of these, in M. Chantre's opinion, bronze was introduced from Italy, and not by way of the Danube. The poverty of the British Isles in works of art belonging to the Bronze age renders it very difficult to classify them either with the Danubian or the Mediterranean group, for they are just as likely to have derived their types from France as from the Danube or the Valley of the Rhine. They may be more satisfactorily classified with the former than with the latter, since the knowledge of bronze was introduced, as we have seen in the last chapter, by a Celtic race after the conquest of the neighbouring parts of France. The peculiarities (such for example as the holes on either side of the mid rib of the spear-heads) which lead some writers to look upon Britain[2] as an independent province, seem to me to be the necessary result of the country being fenced off from the Continent by a barrier of sea.

[1] Montelius, *Sur les Poignées des Épées*, Congr. Int. Archéol. Préhist., Stockholm vol., 1874, p. 883.

[2] According to Waldemar Schmidt, Great Britain is to be looked upon as a "zone speciale," to the exclusion of Ireland. *Etudes sur l'Age de Bronze*, Assoc. Franç. 1878.

Each of these divisions merely represents the extent of the influence of each local centre of industry established after the arts of casting bronze became known over the greater part of Europe. Each of these centres arose from certain peculiar advantages. For the Scandinavian, as we remarked above, there was the amber; for the Hungarian the tin mines of Bohemia and Saxony; for the French those of Brittany and of the central plateau of France; for Italy those of Tuscany; while our imperfect knowledge of the mineral riches of ancient Greece renders it impossible for us to assign a reason why it should have been a centre.

The Distribution of Gold in Europe.

We must now pass on to the consideration of gold and amber. Gold is widely distributed in Europe in the older rocks, and from its brilliant colour must have attracted the attention of man probably before the Bronze age. It occurs in the north of Scotland, in Wales, in Cornwall, and in the Wicklow mountains in Ireland, and from its very general association with tin in the alluvial gravels, it probably led to the discovery of the essential constituent of bronze. It was used for earrings, pendants, and necklaces, for ornamenting suits of armour and shields, and for making cups in Britain in the Bronze and Iron ages. The number of gold articles found in Ireland is probably due to its former abundance in that island. Its wide distribution in Europe renders it of little importance in an enquiry into the commercial relations of the inhabitants of Europe in the Bronze age.

The Distribution of Amber.

Amber,[1] although it has ministered to the superstition, luxury, and vanity of mankind rather than to any useful end, has played a most important part in the history of civilisation. It has caused a trade to spring up by which new arts and new ideas were introduced from other countries, that benefited not merely the regions where the amber occurs, but those also traversed by the amber caravans. It was highly prized by the civilised peoples of the Mediterranean, and was used by the inhabitants of Britain, Ireland, Scandinavia, and France, for personal ornaments, in the Neolithic and succeeding ages. In the Bronze age in Britain it was used in pieces sufficiently large to be fashioned into cups, as, for example, that found in a tumulus at Hove, near Brighton. It becomes, therefore, an interesting question to ascertain the localities whence it was widely dispersed over Europe (A of Fig. 168).

The first and most important amber-producing region to be noticed is that of Königsberg, and the surrounding district of Samland,[2] in Eastern Prussia, in which the fossil resin occurs in a pine forest below the level of the sea that extended in the Meiocene age northwards to join the wooded slopes of Iceland, on the one hand, and those of Spitzbergen on the other (see Map, Fig. 6, p. 41). It is found in vast abundance on the sea-shore, and has formed an article of commerce from the earliest historic times. It is picked up also along the coast of West Prussia and Pomerania.

[1] For a learned history of amber, See Dr. W. Pierson, *Elektron*, Berlin, 8vo, 1869.

[2] M. Hjalmar Stolpe, *Sur l'Origine et le commerce de l'ambre jaune dans l'antiquité*, Congress Int. Archéol. Préhist., Stockholm vol., p. 777.

The Emperor Nero, according to Solinus,[1] had no less than 13,000 pounds weight brought to him at one time, and in the year 1770, 65,760 pounds were collected in Prussia. It is also cast up by the sea on the southern and eastern shores of Scania.

The western shores of Denmark are second only in importance to this region, and more especially between the gulf of Nissum and the island of Fäno. To this probably Diodorus Siculus[2] refers when he speaks of the island in the ocean on the shores of which amber is cast up, and in which it is alone met with. It is found along the coast as far to the south as the Zuyder Zee, and is not unfrequently picked up in small quantities on the eastern shores of Britain. In France it is met with in the western shores, and in the Canton of Vallon, in the Vivarais, in the Lower Rhone. This last deposit has been shown by M. Marichaud[3] to have been known in the Bronze age in the south of France, and it is probably that mentioned by Strabo (iv. 6) under the name of λιγγύριον, because of its abundance in the country of the Ligures. It is a clear bright red variety, contrasting with the yellow amber imported from the north. It occurs in Spain in the Asturias; in Italy it is recorded by Prof. Capellini[4] from Lombardy and the district round Bologna; and in Sicily from Catania and several other localities. According to Mr. Franks,[5] the dark red

[1] Julius Solinus, *Edit. Mommsen*, p. 110. [2] v. 23.

[3] *Matériaux*, 1876, p. 541. It seems to me that the clear red colour of the amber described by M. Marichaud, coupled with the passage of Strabo, "πλεονάζει τὸ λιγγύριον παρ' αὐτοῖς (τοις Λίγυσιν) ὃ τινες ἤλεκτρον προσαγορεύουσι," settles the exact meaning of the term λιγγύριον to be a red variety of amber, differing from the yellow or the ἤλεκτρον.

[4] *Congr. Int. Archéol. Préhist.*, Stockholm, ii. p. 777 *et seq.*

[5] Franks, *Congr. Int. Archéol. Préhist.*, Buda-Pesth, 1876, 433.

variety found in Greek and Etruskan tombs at Cumæ and Bari, Nola and Palestrina, was probably derived from Sicily. The Italian amber is believed by Prof. Capellini to have been used by the old Etruskans of Lombardy, while the Sicilian, although it is not mentioned before A.D. 1769, was known to the ancient Greeks. Among other European localities revealed by modern engineering, we must notice many of the low plains of Germany and Wallachia,[1] where it occurs in considerable abundance. A dark red variety is met with in a deposit in the district of the Lebanon.[2]

Amber may have been derived in ancient times from any of the above-mentioned districts, but the golden variety cast up by the waves of the sea, shining brightly in the light of the sun, would naturally be the first to attract the attention of man. The vast quantities cast up by the sea in Samland and Denmark must have rendered those two districts the two most important sources of supply known to the ancients. From these, as we shall see presently, when we deal with the trade-routes of the Mediterranean peoples, Greece and Rome obtained the greater part of their yellow amber. These districts must have benefited by the wares and the arts introduced by the traders from the beginning of this commerce.

Amber was employed for purposes of ornament in the Neolithic age in Scandinavia, France, and Britain. In the Bronze age, however, in Scandinavia and on the shores of the Baltic it was rarely used. In those countries, according to M. Stolpe,[3] its use did not be-

[1] *Congr. Int. Archéol. Préhist.*, Stockholm, ii. p. 777 *et seq.*

[2] Franks, *Congr. Int. Archéol. Préhist.*, Buda-Pesth, 1876, 433.

[3] Stolpe, *op. cit.* Montelius, *Antiquités Suédoises.*

come general until A.D. 700. This fact can be readily explained by its abundance in those districts in early times. Tacitus[1] writes that the natives in his days did not value it themselves, and wondered at the high price paid for it by the merchants. Its rarity therefore in tombs of the Bronze age in the north does not imply that it was not collected for purposes of sale to foreigners, and cannot be taken to negative the existence of a trade with the southern peoples at that remote period.

The paths taken by this commerce point unmistakably to the south, to the ancient civilisation of Italy and of Greece, and they imply the overlap of history, as will be seen in the thirteenth chapter.

The Duration of the Bronze Age North of the Alps.

It may be concluded, from the facts accumulated by various observers in different countries,[2] that the Bronze age lasted longer in some parts of Europe than in others. In Italy it is not so clearly marked off from the Iron age as in the region north of the Alps, and the designs which are clearly traceable to the Iron age of the south occur in Germany in the late Bronze age. And while it was being superseded by the higher civilisation in Germany, it still held its ground on the shores of the Baltic. It did not finally disappear from Scandinavia until the beginning of the Christian era, and the characteristic short swords and round targets of the tribes

[1] *Germania*, cxlv. "Diu inter cætera ejecta maris jacebat, donec luxuria nostra dedit nomen. Ipsis in nullo usu: rude legitur, informe perpetua, pretiumque mirantes accipiunt."

[2] Wiberg, Worsaae, Hildebrand, Montelius, Waldemar, Schmidt, Virchow, Bonstettin, Lindenschmidt, Chantre.

between the island of Rugen and the Vistula,[1] prove that its traces remained as late as the first century after Christ. It disappeared from Britain more than a hundred and fifty years before Christ, and from France probably long before.

Commercial Relations of Britain in the Bronze Age.

The next question to be considered is the position of the British Isles in the Bronze age, as related to the Continental nations. Were they visited by the Mediterranean traders, or were they cut off from all contact with the Mediterranean civilisation? It may be answered that there is no proof of any direct intercourse with any southern people. The Cornish tin, and the Irish and Welsh gold, tempted daring Phœnician and Greek adventurers probably after the Bronze age had passed away, and within a few centuries before Christ. It is likely, however, that both were worked by the natives in the Bronze age, and that both found their way through Gaul to the Mediterranean. The glass beads discovered in the tombs of the Bronze age in these islands have, like those of France and Germany, been derived from the south, and many of the higher forms of bronze implements, such as the bronze sword (Fig. 131, p. 364), are to be looked upon as foreign. Both were probably passed from hand to hand, and from tribe to tribe, till ultimately they arrived in the islands of the great western ocean. Comparatively free communication might be carried on with the Continent by means of galleys, similar to those

[1] *Germania*, cxliii. Rugii atque Lemovii; omniumque harum gentium insigne, rotunda scuta, breves gladii atque erga reges obsequium.

of Fig. 153, and more especially with Brittany, which presented the same peculiar phase of culture; a communication which was kept up until that region offered a secure refuge to the Britons flying from the Anglian and Saxon invaders.

CHAPTER XII.

THE PREHISTORIC IRON AGE NORTH OF THE ALPS.

Definition of the Iron Age.—The Introduction of Iron into Europe.—The Prehistoric Iron Age in Britain.—Arms and Equipage.—Personal Ornaments.—Burial Customs.—The Late Celtic Art.—The Etruskan Influence on the Art.—The Influence of Ancient Greece.—Coins and Commerce.—The Prehistoric Iron Age on the Continent north of the Alps.—The Prehistoric Iron Age in Scandinavia.—Survival of the Late Celtic Art into the Historic Period in Britain.

Definition of the Iron Age.

WE have now arrived at the stage of the inquiry into the condition of early man in Britain, which is marked by the introduction of iron, the appearance of new arts, and of a coinage. The use of iron characterises the latest phase of the Prehistoric, as well as the whole of the Historic period. The Prehistoric Iron age in Britain is the equivalent of the Neo-Celtic, or the late Celtic of Mr. Franks, of the first Iron age in France and Germany, and of the late Bronze age in Scandinavia.

The Introduction of Iron into Europe.

The application of iron to the purposes of daily life marks an important era in the civilisation of Europe. Iron appears in the Heroic age of Greece as a rare

material, which was slowly replacing bronze for cutting implements; and in the Homeric legends the heroes are described as fighting with weapons of bronze and of iron. A lump of iron was among the prizes in the games at the celebration of the funeral of Patroklus.[1] In the time of Hesiod, who flourished 400 years before Herodotus, or B.C. 850, it had already superseded bronze among the Greeks, and to him we owe the knowledge that the age of Bronze was as well recognised by his contemporaries as by modern archæologists.[2] Hesiod and Lucretius distinctly point out that, according to the voice of tradition, the use of bronze disappeared before the spread of the more useful metal; it long survived for making helmets, shields, and armour, and has been used for purposes of ornament down to the present day.

There is no reason to suppose that iron was first discovered in Europe. It is more probable that, like bronze, it was discovered in Asia, and that it was derived from the south.[3] It would spread very rapidly from the old centres of Egypt, Assyria, and Phœnicia, over the Mediterranean area; and from Greece and Italy it would penetrate to the north and west by the ordinary channels of commerce. When the natives had once learned the art of reducing it from its ores, they would no longer be dependent upon distant sources of supply for the materials for making implements and weapons, as they were in the Bronze age. Iron ores occur in very nearly every country in Europe, and have been worked in very remote times. The supply of iron in Britain, in

[1] *Iliad*, xxiii. p. 826.

[2] For a criticism on the derivation and use of iron among the Greeks, see Evans, *Ancient Stone Implements*, pp. 3, 4, 5.

[3] Worsaae, *La Colonisation de la Russie et du Nord Scandinave*, Copenhague, 1875, p. 77 *et seq.*

the days of Cæsar,[1] was sufficient for the needs of the inhabitants, as it was in Gaul, and his statement that the Britons of his day used iron rings, or bars of a certain weight, in place of money, while their bronze articles were imported from abroad, expresses the relation of the two metals to one another in Britain in the Prehistoric Iron age with the greatest accuracy. It was sufficiently abundant, not merely for the manufacture of weapons, but for making tires for the wheels and other fittings for the chariots.

The historic evidence that iron gradually supplanted bronze is confirmed by numerous discoveries in various parts of Europe. A bronze socketed celt, with a thin edge of iron let into it, has been met with in an ancient Etruskan tomb at Villanova, near Bologna;[2] and bronze axes have been discovered in Scandinavia with their edges formed in the same way. Bronze swords have been discovered in Switzerland in the lake-dwellings, at Moeringen, and elsewhere, with the hilts inlaid with iron, and in association with iron swords of the leaf-shaped type so characteristic of the Bronze age. In Britain also, iron and bronze swords[3] have been found together of the same leaf-shaped pattern; and a spear-head found in Scotland consists of an iron core[4] covered with the harder and more brittle bronze. It may therefore be concluded that iron was introduced into these countries first of all in small quantities, that it was highly esteemed, and that it gradually supplanted bronze.

[1] v. c. 10.

[2] Gozzadini, *Intorno Agli Scavi Archeologia fatti dal Sig. Arnoaldi Veli, presso Bologna*, 4to, 1877. *Congr. Int. Archéol. Préhist.*, Bologna vol., 1871, 242. Burton, *Etruscan Bologna*, 1876, p. 65.

[3] Wilson, *Prehistoric Annals of Scotland*. Second edition, ii. p. 129.

[4] Wilson, *op. cit.* ii. pp. 12, 13.

The Iron Age in Britain.

The Prehistoric Iron age in Britain was probably of short duration in comparison with that of Bronze. It is represented principally by the contents of an insignificant number of tombs, and by numerous isolated articles, of which the age can only be fixed by the identity of the ornamentation with that of well-known artistic styles.

Arms and Equipage.

No difference is noticeable in the habitations and forts in Britain in the Iron age, as compared with those of Bronze. The crannoges of Ireland were still inhabited, as well as the camps which had been made in the Neolithic and used in the succeeding age. It is, however, clear from the observations of Cæsar, that the small isolated communities which we have observed in the Neolithic age were welded together, and formed larger bodies obedient to one rule. The civilisation was much higher, partly from the accumulation of wealth, and partly from contact, direct and indirect, with the culture of the south.

The warriors in the Iron age of Prehistoric Britain were armed with short, leaf-shaped iron swords for stabbing, modelled on those of bronze, and afterwards, and especially in the north,[1] with long iron swords without a point,[2] probably used for cutting and not thrusting. For the latter purpose bronze is far better, and with the

[1] Tacitus, *Agricola*, c. 56. For the history of the long swords, see Kemble and Franks, *Horæ Ferales*.

[2] The entrenchments at Stanwick have furnished a considerable quantity of antiquities of the Prehistoric Iron age, including enamels, and remains of chariots, of chain-mail, and a long iron sword.—*Journ. Archæol. Institute*, York vol.

introduction of iron a change in the fashion of the sword became necessary. The hilt grew larger, and the hand was protected by a guard, which was wholly wanting in the short stabbing swords of the Bronze age. The spears, javelins, daggers, and arrows were tipped with iron. Metal helmets were not then worn, but the body was protected sometimes by ring-mail, at others by bronze gorgets, in one example, to be described presently, covered with a thin plate of gold worked in *repoussé* (Figs. 159, 160). Their shields were round or

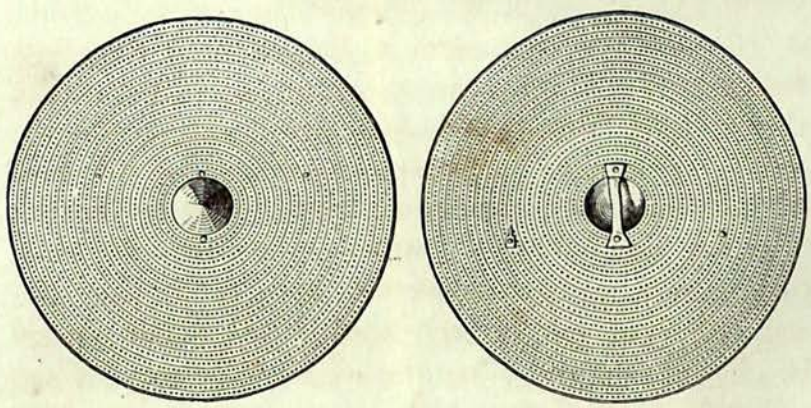


FIG. 156.—Bronze Shield, Giffin Castle, Ayrshire.

oblong, made of bronze (Fig. 156) or of wood, with bosses and studs of iron. Some of those of bronze were ornamented with figures of animals, and with studs of red coral, or of enamel, such as Cæsar describes among the Gauls. They possessed also wooden chariots with iron fittings, and their horses wore bronze and iron trappings, ornamented with various designs, sometimes with patterns in blue, red, yellow, and green enamel.[1]

[1] The principal authorities followed in this account are Kemble and Franks, *Horæ Ferales.*

Personal Ornaments.

The personal ornaments show considerable artistic finish, and were in part modelled on designs obtained from the south. Two singular gold articles, ornamented in *repoussé*, found in Ireland (Fig. 157),[1] may have been intended for caps like the Etruskan "tutuli," or those worn by the Assyrian kings. Similar objects have been discovered in France and in Germany. Round the neck they wore torques of gold, bronze, or iron; round the arms bracelets, and round the waist belts of the same materials. Brooches were used made of bronze, and of the safety-pin[2] type as well as of other forms, sometimes ornamented with enamel. They had finger-rings of gold, as well as of bronze and iron; and necklaces of amber, jet, and of glass. The torques and bracelets are generally solid, and belong to the "beaded" type of Dr. Birch.[3]

FIG. 157.—Golden Cap, Devil's Bit, Tipperary.

They also wore circlets on their heads made of bronze or gold, sometimes ornamented with beautiful designs in volutes and flamboyants, like those of the bronze head-ring found in the village of Stitchel[4] (Fig. 158) in Roxburghshire. Silver was used not merely for personal ornament but for inlaying the hilts of the swords. The precious metals were probably stored up among the

[1] Wilde, *Cat. R. I. Academy*, ii. Gold Articles.
[2] Wilde, *op. cit.* i., Figs. 474, 475, 476.
[3] *Archæol. Journ.*, ii. 368; iii. 27.
[4] Wilson, *Prehistoric Annals of Scotland*, ii. p. 146.

Britons as among the Gauls, in the shape of ornaments easily hidden and carried about, and this practice may

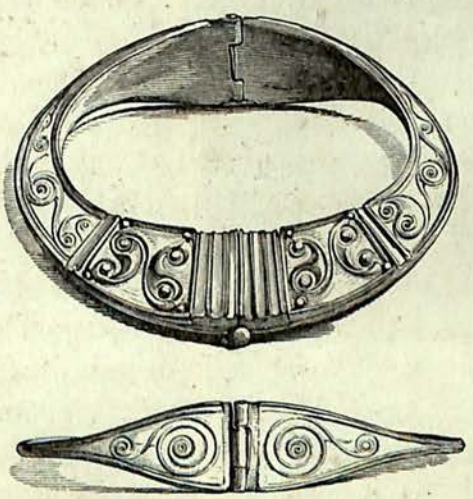


FIG. 158.—Bronze Head-ring, Stitchel.

perhaps account for the statement of Herodotus[1] as to the large quantity of gold in the northern parts of Europe. It was probably the hoarded wealth of ages.

Burial Customs.

With the introduction of iron a change took place in the burial customs in Britain. Cremation was carried on, but the dead were frequently interred at full length in a stone chamber or shallow pit, along with various articles used in daily life. We may take as an example of interments belonging to this age the group of circular barrows at Arras,[2] near Market Weighton, explored by the Rev. E. W. Stillingfleet. In a shallow pit at the base of one of these, named the Barrow of the Charioteer,

[1] iii. c. 116. [2] Thurnam and Davis, *Crania Britannica*, Pt. xii.

a skeleton of a warrior was discovered resting on his shield, which was made of wood, with a bronze boss in the centre and an iron rim. On each side was an iron horse-bit, with the metallic portions of harness, and the wheels of a chariot. These were of oak, two feet eight inches in diameter, with iron tires, and each had sixteen spokes. Two boars' tusks were close by the skeleton, one of which was carved and fitted into a singular little bronze case. A second, termed the King's Barrow, yielded similar remains. A skeleton of an old man lay in an excavation in the chalk about one and a half feet deep, resting on his back, with arms crossed on the breast, and legs crossed. The skulls of two wild boars were close to the head, and on either side a chariot wheel, and the skeletons of two small horses with all their iron and bronze accoutrements.

A third tumulus, about three feet high, termed the Queen's Barrow, gives us an idea of the interment of a woman of rank. A female skeleton lay in a grave cut in the chalk about a foot deep, with head to the north, and with feet gathered up. The neck had been surrounded by a necklace of about a hundred glass beads, most of which were deep-blue with circlets of white, some of clear green colour, traversed by a wavy opaque white line, probably intended to represent the figure of a snake. A ring of red amber lay near the breast, as well as a radiated fibula of Roman type, and a pendant to match set with ivory, two bronze bracelets ornamented with enamel, a bronze ring, tweezers, two pins with rings at the head, and a gold finger-ring. A small socketed celt, about an inch long, with a small light-blue glass bead attached to it by a pin, was discovered in another barrow in this group. It had been

used as an ornament, and may be looked upon as a survival from the Bronze age.

These barrows are considered by Dr. Thurnam to be those of Gallic tribes, and to range in antiquity from a century before, to a century after Christ. They give a vivid picture of the burial customs of the time; the warrior and the hunter were sent off on their last long journey in their chariots and with their horses, and in some other cases, such as that at Aspatria in Cumberland, with their swords, as well as with trophies of the chase; while the women were buried with ornaments which would render them conspicuous in the world of spirits.

These discoveries, made in the years 1816-17, have recently been followed up by the exploration of another barrow in the neighbourhood, by the Rev. W. Greenwell,[1] in which he found a skeleton in a contracted position, with the remains of horse-trappings and two wheels of a chariot, but no traces of the body of the chariot. The skeleton is considered by Dr. Rolleston to be that of a woman, and a small, round, iron mirror was found along with it ornamented with a plating of bronze. A bronze brooch of the safety-pin type has been discovered in another barrow in the East Riding of Yorkshire, along with solid bronze bracelets and other articles belonging to the Prehistoric Iron age.[2]

One of the most remarkable discoveries of works of art of foreign derivation in a burial mound was that made, by Mr. John Langford in 1832,[3] in a cairn near Mold in North Wales. On removing upwards of three

[1] *Ancient British Barrows*, p. 450. [2] Greenwell, *op. cit.* 209.

[3] Gage, *Archæologia*, xxvi. 422. Williams Ap Ithel, *Archæol. Cambrensis*, iii. 98. *Archæol. Journ.*, vi. 259; xiv. 291.

hundred cart-loads of stones a skeleton was discovered laid at full length, wearing a corselet of beautifully-wrought gold, Figs. 159, 160, which had been placed on a lining of bronze. Close by were upwards of three hundred amber beads as well as traces of corroded iron. The corselet is formed of a thin plate of gold, three feet seven inches long, eight inches wide in the centre, and weighing seventeen ounces, and is ornamented in *repoussé* with nail-head and dotted-line pattern. It is a work of Etruskan art, as we shall see in the next chapter, and not of local manufacture, like the breastplates of great value stated by

FIGS. 159, 160.—Golden Corselet, Mold, North Wales.

Polybius to have been made and worn by the natives of Gaul.[1] An urn full of ashes, about three yards off, may have belonged to an interment of the same

[1] ii. c. 11.

age. The name of the cairn is Bryn-yr-Ellyllon, goblin or fairy hill. The place was supposed to be haunted, and before the discovery was made a spectre was said to have been seen to enter the cairn clad in golden armour. This superstition is merely a survival of the idea so universal among the cairn-builders, in all ages and all countries, that the tomb was the home of the spirit, whence it issued into the upper world.

The practice of burying the dead at full length was first known in Britain in the Prehistoric Iron age, but it did not supersede cremation. The ashes of the dead were interred in megalithic tombs, sometimes of considerable magnitude, sometimes enclosed in a pyramidal mound or cairn. A magnificent group of these is to be seen on the banks of the Boyne near Drogheda, consisting of seventeen large mounds, of which the most important is that of New Grange.[1] It consists of a cruciform sepulchral building, 89 feet long, with transepts 21 feet from end to end, made of large blocks of stone, encased in a truncated cairn 70 feet high, 310 feet in diameter, and surrounded by a circle of large upright stones. The platform at the top is 120 feet across. At the point of the intersection of the transepts with the long passage, the roof rises into a conical dome 20 feet high. In each of the three chambers, forming the head and arms of the cross, was a shallow stone basin from 3 to 3½ feet long, and from 6 to 9 inches deep. These stone basins have been proved, by Mr. Eugene Conwell's discoveries at Lough Crew,[2] to have contained the ashes of the dead. The surface of the stones in the chambers

[1] Fergusson, *Rude Stone Monuments*, p. 200 *et seq.* Wilde, *The Boyne and the Blackwater*, 1849, p. 188.

[2] *Proceed. R. I. Acad.* SS. I., No. 6, p. 72.

at New Grange and at Lough Crew is ornamented with various carvings in spirals, concentric circles, flamboyants, and zig-zags, forming part of the Prehistoric series defined by Mr. Franks as the late Celtic, and which are to be seen on many of the early Christian crosses and inscribed stones in Scotland, and in many of the illuminated Irish missals. These, however, are more rude and archaic than any of the above, and seem to me more likely to belong to a pre-Christian era rather than to the first four centuries after Christ, to which they are referred by Mr. Fergusson. They belong to a time before history began in Ireland, and before the introduction of Christianity, when the dead were burned and their ashes placed in the above-mentioned stone basins.

The Art.

The peculiar art of the Prehistoric Iron age[1] in Britain, termed late or Neo-Celtic, is represented in its simplest form in Fig. 161, taken from the bronze sheath of an iron dagger found in the river Witham, and is met with in various personal ornaments, horse-trappings, and other articles, in Britain and Ireland. It is present on the sculptured stones of Scotland (Figs. 162, 163), frequently in combination with the mystic Z emblem, and the double-mirror pattern (see Fig. 162), and sometimes along with the broken sceptre and the crescent, the snake, and a curious animal formed of flowing lines in which the natural shape is only to be recognised because it forms one of a series (Fig. 163). In its more ornate

[1] For examples of this art, see Kemble and Franks, *Horæ Ferales;* Wilde, *Catalogue of Antiq. in R. I. Academy*, I.; Stuart, *Sculptured Stones of Scotland;* Wilson, *Prehistoric Annals of Scotland.*

form of the "trumpet pattern," or flamboyant, it is seen in various ornaments of the type of Fig. 158. In

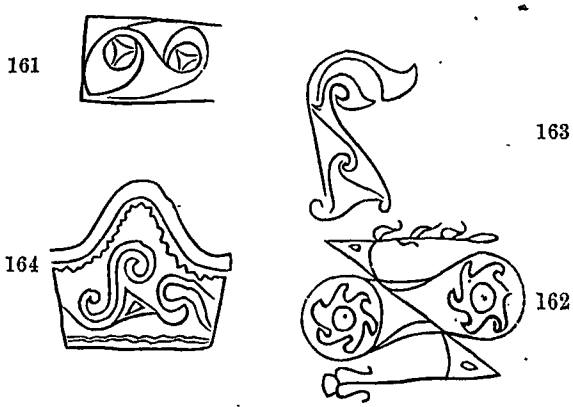


FIG. 161.—Late Celtic Pattern, Dagger Sheath, Witham.
FIG. 162.—Z and Double Mirror, Dunnichen Stone.
FIG. 163.—Strange Animal form, Dunnichen Stone.
FIG. 164.—Design on Bronze Sheath, Marin.

this shape it is frequently associated in Ireland and in Scotland with the Germanic knotted-cord pattern (Fig. 167). Its distinctness, however, from this is proved by its wide distribution over France and Switzerland long before the Germanic invasion of those countries. In the lake-dwelling of Marin,[1] for example (Fig. 164), it occurs on many of the scabbards and ornaments belonging to the ancient Helvetians of that district; and in Scandinavia it is to be seen on one of the sculptured slabs in the famous tomb of Kivik, belonging to the Bronze age.

The art of enamelling the surface of metal appears for the first time in north-western Europe in the Prehistoric Iron age, and its chief centre seems to have been the British Isles and the adjacent parts of Gaul.[2]

[1] Keller, *Lake-Dwellings*, transl. by J. E. Lee, 2d. edit.

[2] Kemble and Franks, *Horæ Ferales*, p. 64. Dawkins, *Cave-hunting*, p. 99.

The Etruskan Influence.

The designs of the metal work of the Prehistoric Iron age in Britain are not to be looked upon as being the spontaneous development of those of the Bronze age, but to have been derived from abroad. The flowing lines, the flamboyants, and the various combinations of the spiral, unknown in Britain before, were introduced from France and Germany, through which countries they may be traced as far as Greece and Italy. In Mr. Franks' opinion they have been derived from the south,[1] and are to be looked upon as marking the influence of the Etruskans and Greeks upon the regions north of the Alps. Two distinct influences were at work in Britain in the Prehistoric Iron age, of which the one is far older than the other. Certain articles, such as the gold cap found in the bog at Devil's Bit, County Tipperary (Fig. 157), are ornamented with designs which may be traced through France and Germany to Hallstadt, and ultimately into ancient Etruria. The same may be said of the gold armour discovered at Mold (Figs. 159, 160). These two may be taken as the types of a large class of articles, which testify to the far-extending influence of the Etruskans, which we shall define in the next chapter. In all probability the overland trade with Etruria was the first which brought the art of the Mediterranean to the shores of Britain and Ireland (see Map, Fig. 168).

The Influence of Ancient Greece.

Ancient Greece also exercised an influence on Prehistoric Britain, but only after the decline of the Etruskan

[1] *Congr. Int. Archéol. Préhist.*, Brussels vol., 1872, p. 516.

power. The colony of Massilia was a centre from which the Greek culture passed through Gaul, and ultimately made itself felt even in the remote parts of Britain, attracted by the tin mines, and possibly also the gold, silver, and iron mentioned by Strabo and Cæsar.[1] The existence of a Greek commerce is proved by the designs on the first coins which appear in Britain, modelled upon Greek originals, and shown by the researches of Mr. Evans[2] to be, for the most part, imitations of those of Philip of Macedon. In his masterly work on ancient British coins he has traced them through Gaul into Britain. They were not imported directly, but were copied over and over again by the tribes who used them, becoming more illegible the farther they were removed from the Greek influence. This process went on until the inscription and the figures are represented by imitations so barbarous, that they would not have been recognised had it not been for the whole series showing the intermediate changes.

The gold staters of Philip of Macedon (B.C. 360) were highly esteemed by the neighbouring peoples, and passed into circulation far away from the limits of Greece, and were looked upon among the outer barbarians of Gaul, Germany, and Britain as a medium of exchange like the Maria Theresa dollars among the Abyssinians. As these coins passed northwards, they departed more and more from the original types. In Gaul the head of Apollo on the Philippus came to be represented by fragments, among which the laurel crown is most prominent, while on the reverse a rudely-stamped horse and wheel stood for Victory in her chariot. In one Gaulish imitation

[1] Strabo, iv. 278; Cæsar, v. c. 10, Clarke's edition, c. 12, Doberentz edition.

[2] *Ancient British Coins*, c. ii.

Victory has a torque, or armlet, in her hand instead of a crown; a fact which shows that those ornaments were marks of distinction like crowns among the Greeks. The meaning of the coins was to a great extent lost by the time they arrived in Britain, and the crown of Apollo became transformed into an ear of barley. Mr. Franks[1] considers that the designs of the Prehistoric Iron age have been derived from classic originals, which have been treated in the same way as the coins.

Coins and Commerce.

The date of the earliest British coins is fixed by Mr. Evans between B.C. 200 and 150.

The evidence of the coins proves that trade was carried on with the neighbouring tribes of Gaul, and that commodities from Britain were passed from tribe to tribe until they arrived at Massilia. In later times a more direct intercourse was carried on, and caravans passed from the shores of the Mediterranean to the shores of the English Channel. Coins of silver and brass appear, some struck in the same dies as the later series of gold. Counterfeit coins also have been discovered, composed of copper or bronze covered with gold or silver. British coins were first struck in the south-eastern parts nearest to Gaul, and they are found as far west as Cornwall, and north as Yorkshire. According to Solinus,[2] money was not current among the Silures of South Wales in the first century after Christ. Among other traces of the trade with the Mediterranean we

[1] *Congr. Int. Archéol. Préhist.*, Brussels vol., 1872, p. 516.

[2] *Monumenta Historica Britannica*, p. x.

may mention the red coral ornamenting the oblong shield found in the river Witham near Lincoln.[1]

Britain also was connected with the trade-route passing down the valleys of the Rhine, and from the intimate association of the British with the adjacent Gallic tribes, they must have been acquainted with the arts of navigation. The Veneti possessed a marine capable of contending with the Roman galleys almost on equal terms, and the Britons first came in contact with the Roman arms as their allies. It may be concluded also that they were acquainted with the nearest coasts of Denmark and Germany, from their possession of ships, and from the fact that Pytheas sailed from the North Foreland to explore Thule and the amber coast.[2]

Prehistoric Iron Age on the Continent North of the Alps.

The civilisation of the Iron age in France, Switzerland, and Germany, presents no important points of difference as compared with that of Britain. It was, however, more directly influenced, as would naturally be expected, by the Etruskans and the Greeks. M. Chantre[3] has called attention to the numerous articles of metal work of Etruskan design, which have found their way through the passes of the Alps into France; and Lindenschmidt,[4] Hildebrand,[5] Virchow,[6] and others, to those

[1] *Horæ Ferales*, pl. xiv. [2] See Chapter XIII.

[3] *Congr. Int. Archéol. Préhist.*, Stockholm vol., 1874, 411. *Matériaux*, 1878, p. 1. See also Delort, *Mat.*, 1878, p. 57; and Flouest, *Mat.*, 1877, p. 273.

[4] Lindenschmidt, *Die Alterthümer unserer heidnischen Vorzeit.*

[5] *Congr. Int.*, Stockholm, 1874, 592.

[6] *Congr. Int.*, Buda-Pesth vol., 1876, pp. 252 and 449.

finding their way in the Iron age as far as the shores of the Baltic. The Greek influence is proved also in the same regions by the distribution of Greek coins and their imitations, and some of the painted vases found in Germany may have been imported from Greece. The Iron age in those countries began several centuries before the Christian era. It appears, however, from the evidence brought together by Worsaae,[1] Engelhardt, and others, that iron was not used in Scandinavia until about the beginning of the Christian era.

This overlap of the Bronze age in Scandinavia with the Prehistoric Iron age in Germany will go far to explain the beauty and fine workmanship of the Scandinavian implements, weapons, and ornaments of Bronze. The higher designs were probably derived from the Etruskans and the Greeks, and are some of them identical with those characteristic of the Iron age in Germany, France, and Britain. Other articles, such as the *repoussé* shields, sword-belts, and golden cups,[2] were probably imported from Etruria. Thus we see that the Iron age in Scandinavia is very nearly the equivalent of the beginning of the Historic age in Britain, and we have proof of the overlap of History and Prehistoric Archæology.

The Prehistoric Iron Age in Scandinavia.

Iron was introduced into Scandinavia by the Germanic tribes who conquered the previous inhabitants, about the beginning of the Christian era, and the civilisation which they introduced has been maintained

[1] *La Colonisation de la Russie et du Nord Scandinave;* and *Congr. Int.*, Buda-Pesth, p. 253.

[2] See Montelius, *Congr. Int.*, Stockholm vol., 1874, p. 505.

without a break in those regions down to the present day. The Iron age is divided by the Scandinavian[1] archæologists into three divisions; the first of which extends as far down, according to Worsaae, as A.D. 450, and is characterised by the abundant proof of the influence of the Roman Empire of the West engrafted upon the low German culture; the second is marked by the palpable traces of the influence of the Roman Empire of the East, radiating from Constantinople; and the third, ranging from A.D. 700 to 1000, is known as the period of the Vikings. The history of Scandinavia may be said to date from the second of these, although from time to time a ray of light is thrown upon its previous condition in the records of other countries. In the middle of the first of these periods the corsairs issuing from the Baltic and the ports to the west of the Cimbric Chersonese harried the coast of Britain and Gaul to such an extent in the third century, that they could scarcely be kept in check by the organisation of a Roman fleet, and thus prepared the way for the conquest by which the Roman Britannia[2] became England. The long ships which composed their fleets were merely modifications of those which are figured in p. 394, from the rocks in Sweden engraved in the Bronze age. We have also representations of boats of the Iron age. In Fig. 165 I have reproduced a sketch incised on a rock at Häggeby in Uplande,[3] representing a boat with twelve pairs of oars, in which the prow and the stern are formed in the same way. A boat of this kind has been discovered in

[1] Worsaae, *La Colonisation de la Russie et du Nord Scandinave*, trad. par E. Beauvois. 1875.

[2] A.D. 286. Under Carausius, *Mon. Hist. Brit.*, lxxii. lxxx.

[3] Montelius, *Congr. Int.*, Stockholm vol., p. 459.

a peat bog at Nydam in Schleswig, by M. Engelhardt[1] in 1862, along with iron arms and implements, and in

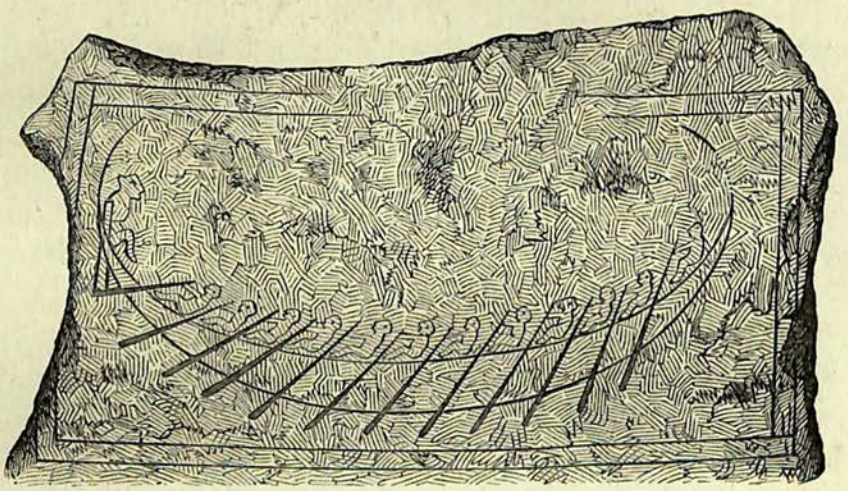


FIG. 165.—Boat engraved on rock, Häggeby, Uplande.

association with Roman coins ranging in date from A.D. 67 to A.D. 217. It therefore may be assigned to the third century. It was made of oaken boards, and was seventy feet long by eight or nine wide. The same kind of boat is also mentioned by Tacitus[2] as being used by the Suiones, with stem and stern alike, fitted for being drawn up on the beach and without sails. It is, however, clear from his description that this was not the form usually employed in the navigation of the North Sea, and he had in his mind ships with a prow and stern wholly unlike one another.

[1] *Guide Illustré du Musée des Antiquités du Nord à Copenhague*, 2me ed., p. 25. See also Lubbock, *Prehistoric Times*, p. 8.

[2] *Germania*, c. 43.

Survival of the Late Celtic Art into the Historic Period in Britain.

The designs introduced into Britain in the Prehistoric Iron age still survive. The volutes and flamboyants on the metal-work of the Prehistoric inhabitants of Britain and Ireland are found on ornaments proved by the associated coins to belong to the fifth or sixth centuries after Christ. The example here figured (Fig. 166) is that of a bronze brooch, ornamented in *repoussé*, found in the Victoria Cave.[1] The same designs are conspicuous in the illuminated Irish manuscripts,[2] such as the Gospel of St. Patrick, the book of Kells, and others, on early Irish Christian chalices,[3] and on caskets discovered in France and Scandinavia. They also occur in the ornamentation of many engraved stones and crosses found[4] in Scotland, and ranging at least as late as, and probably later than, the twelfth century.

FIG. 166.—Bronze Brooch, Victoria Cave, Yorkshire, ½.

The silver ornaments discovered in the Norries Law[5] tumulus, in Largo Bay on the Firth of Forth, are also to be classified with the late Celtic art, which survived into the Historic period. The flamboyant design of Fig. 166 is to be seen in a silver plate in combination with the

[1] The relation of these designs to Irish art is treated in my work on *Cave-hunting*, p. 94 *et seq.*

[2] Westwood, *Palæographia.*

[3] Dunraven, The Earl of, *Ancient Chalice and Brooches lately found at Ardagh, Limerick*, Trans. R. I. Acad. xxiv. Antiquities.

[4] Stuart, *Sculptured Stones of Scotland*, Spalding Club, 2 vols. 4to.

[5] Wilson, *Prehistoric Annals of Scotland*, ii. pp. 220, 250, Figs. 144, 153.

Z, or the broken sceptre symbol, and a strange animal composed of volutes, so frequently repeated on the ancient sculptured stones and crosses of Scotland (Figs. 162, 163). In a silver pin it is also to be seen below a Greek cross, while on the other side of the head are mystic symbols of unknown meaning.

These elegant and graceful designs are combined with the interlaced cable or rope pattern (Fig. 167), of Germanic origin, which was unknown in Britain before the English Conquest. The original[1] of this figure is part of the ornamentation of a tombstone in Fordoun Church, Kincardineshire, where St. Palladius (A.D. 450) is said to have been buried. It is accompanied by the double-mirror and Z (Fig. 162), the snake, the spiral patterns (Fig. 158), and the figures of three men on horseback, one bearing a spear. This combination may be taken as an outward sign of the fusion of the two peoples in Scotland and Ireland. The graceful fancy of the Celt was joined to the heavy and massive design of the German, and is to be seen equally in the results of the patient labour of the scribe in his cell, and of the sculptor and metal-worker, who have left more palpable, though probably not more enduring, proofs of their wonderful art. The two designs are at the present time used in the jewelry of both Ireland and Scotland.

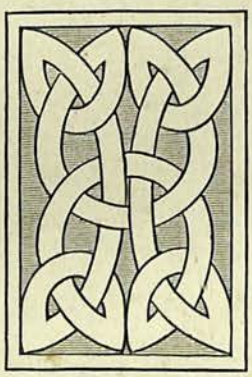


FIG. 167.—Knotted-rope Pattern, Fordoun Church, Kincardineshire.

The same combination is visible in the enamel work.

[1] Stuart, *Sculptured Stones of Scotland*, i. pl. 67.

The massive square form of the Germanic pattern is seen in Saxon, Frankish, and Merovingian brooches, as well as in the silver chalice of Ardagh, set off by the brilliant colour of the Celtic enamels. In both these cases the art reflects the history of the times immediately succeeding the Germanic invasion.

CHAPTER XIII.

THE OVERLAP OF HISTORY.

The Egyptians and their Influence.—The Assyrians and their Influence. The Phœnicians and their Influence.—The Phœnicians possessed no Art of their own.—The Position of the Phœnicians in the West.—The spread of Phœnician Commerce to Britain.—The Etruskans and their Influence.—The Etruskan Trade—Routes to the Amber Coasts.—Traces of Etruskan Influence north of the Alps.—The Downfall of the Etruskan Trade.—The Greeks and their Influence.—The Trade-route from Olbia.—The Trade-route from Massilia.—The Voyage of Pytheas.—General Conclusions.

The Overlap of History.

THE Historic period constitutes the last phase of the series of changes which have been reviewed in our inquiry into early man and his place in the Tertiary period. It embraces the events recorded in history which are not only arranged in a linear series, but also possess a definite chronology in terms of years. It differs in this last respect from all the preceding geological periods, of which we know only that they followed one another in a definite order, but to which we cannot assign a date, because there is no standard of comparison to show the contemporaneity in different regions. We have seen in the last four chapters that there is reason for believing that one part of Europe

was in the Bronze age while another was in the Neolithic age, and that iron gradually penetrated northwards, until it arrived in Denmark at the beginning of the Christian era; and it has been impossible for us to shut our eyes to the traces of civilisation coming in from the Mediterranean area. Egypt, Assyria,[1] Etruria, Greece, and Phœnicia were the seats of a high civilisation for many centuries before Christ, and when the written record began were not in the Bronze but in the Iron age. It is a question equally interesting to the historian and to the archæologist, to ascertain the extent to which the light of their culture penetrated the darkness of central, western, and northern Europe, and to see whether it be possible to picture to ourselves the condition of Europe as a whole at one time; to see whether we can bring the Historic period in the Mediterranean region into relation with the Prehistoric period north of the Alps which has hitherto engaged our attention. This overlap, as it may be termed, of history with Prehistoric archæology may best be studied by treating each of these influences separately.

The Egyptians and their Influence.

In the earliest records which we possess we find a civilisation put prominently before us of a high and complicated kind,[2] not much inferior to any that have succeeded it, and which dates so far back that the history of all the European peoples is in comparison

[1] In the early Chaldæan Empire (Sayce, *Contemporary Review*, Dec. 1878, p. 71) bronze was more commonly used than iron.

[2] Chabas, *Etudes sur l'Antiquité Historique d'après les Sources Egyptiennes*, 2d ed. 8vo, 1873. Stuart Poole, "Ancient Egypt," *Contemporary Review*, Jan. to May 1879.

almost a thing of yesterday. The history of Egypt, beginning about 4000 years B.C. with the reign of Menes,[1] is the starting-point of the Historic period in the Mediterranean, and is therefore thrice as long as that covered by the records of this country.

Egypt from the very first was the great centre of light in the eastern part of the Mediterranean, on which all eyes were fixed, and it was a mart in which the products of the far east and the far west met together, and into which flowed the merchandise of three continents. As far back as twenty-eight centuries B.C. the Egyptians possessed powerful fleets for purposes of defence and attack; and we read of a naval engagement in the reign of Papi, B.C. 2800.[2] They are said to have taught the Phœnicians how to make glass, and to have instructed the early Greeks in the sciences.

Of their knowledge of the arts every museum is eloquent. It is impossible to walk through the Egyptian courts in the national collections in London, or in the Louvre, or in the Vatican, without carrying away a deep impression of their power and their skill. Yet their high position was achieved without the knowledge of steel.[3] They were acquainted with iron; bronze they used extensively, not merely for ornaments but for daggers and axes of the simple types usually considered characteristic of the early bronze civilisation north of the Alps. Flint knives were sometimes used for religious purposes, beautifully fashioned; and flint daggers such as that in the British Museum with a wooden handle. Pointed splinters of flint also were employed for cut-

[1] Chabas, p. 16. Lepsius fixes the date of Menes at 3892 B.C.; Mariette at 5004 B.C.; Brugsch at 5004 B.C. [2] Chabas, p. 174.

[3] Steel is not found in any of the older tombs.

ting hieroglyphs, a fact which is proved by the discoveries made in their turquoise mines in the Sinaitic promontory by Mr. Bauerman[1] and others. It is very probable that all the hieroglyphs were carved with flint, since neither bronze nor iron will cut the hard rocks on which they are generally engraved. Steel, however, was known in Egypt in a later period of its history.

The influence of such a people as the Egyptians was felt far and wide in the Mediterranean, and their wealth invited invasion at a time when great movements of population were taking place. The first mention of a European people in the Egyptian annals is the attack of the Sardones and the Tyrrhenes (Etruskans) on the Delta of the Nile, and their defeat by Ramses II., in the fifteenth century before Christ. This invasion was again repeated, about seventy years afterwards, by a more formidable confederation, in which the two above-mentioned peoples were joined by the Sikels, Lykians, Achaians, and Lybians. The allies advanced to the attack by sea and land, conquered part of the Delta, and were defeated after a desperate struggle by Meneptah I.[2] Among their spoils it is interesting to remark bronze knives and cuirasses. From this account it is clear that the maritime peoples of the Mediterranean were sufficiently civilised at this early period to organise powerful armies and fleets, and to deliver a combined attack on the mistress of the world; and it places prominently before us the intercourse and commerce which could alone render such a combination possible. The Sardones and Etruskans may not have been then in

[1] Dawkins, *Proceed. Manch. Lit. and Phil. Soc.*, Dec. 14, 1869, p. 43.

[2] Chabas, *op. cit.* pp. 186, 224. Stuart Poole, *Contemporary Review*, Jan. 1878, 347.

Sardinia and Etruria, which may have derived their names, like England, from their conquerors. It seems, however, more probable that they were already in possession of those regions, since the influence of Egypt is proved to have extended as far to the west as Sardinia, by the scarabæi and other remains found in the tombs. The extent to which the Etruskans are indebted to Egyptian art is only to be realised by an examination of their tombs and of the various Italian museums. The discoveries at Cyprus and Mykene, and elsewhere in Greece, show that the influence of Egypt was directly felt among the ancient inhabitants of the Peloponnese, and the islands of the Archipelago, as was the universal opinion of the early writers of Greece and Rome. It may therefore be said to have pervaded the whole of the Mediterranean area in the fifteenth century B.C., and for how long a time before we have as yet no evidence.

We must now review the position of the great rival, and ultimately the conqueror, of Egypt—Assyria.

The Influence of Assyria.

The great seats of empire on the banks of the Euphrates and Tigris, like Egypt, have their origin concealed in the darkness of the ages; but their first authentic record is the conquest of Chaldæa, in 2280 B.C.[1] From that time forward Babylon and Nineveh extended their dominions, and ultimately became one power, advancing as far north as the Caucasus, taking possession of the copper-mines in the country of the Medes, and probably, also, of the tin mines in Khorasan, and

[1] Sayce, *Enclop. Brit.*, Art. "Babylonia," p. 185.

penetrating to the Mediterranean, under Tiglath Pileser I. (B.C. 1130 to 1090). In 866 B.C. the Assyrians conquered Phœnicia, including the great merchant cities of Tyre and Sidon, and subdued their great rival, Egypt, in 672 B.C., under Esar-haddon. Cyprus fell under the arms of Sargon in 710-705. The conquest of Phœnicia and of Egypt constitutes a landmark in the arts of the Mediterranean peoples, since from that time articles of Assyrian design penetrated to Greece and Italy, and took the place before occupied by those of Egypt, and they continued to hold their own until they were displaced by the development of Lykian art in Greece and the Etruskan art, and that of Magna Græcia in Italy. Their distribution was mainly due to the great traders of the Eastern Mediterranean, the Phœnicians.

The limit of the Assyrian influence to the north is marked by the discoveries in the sepulchral tumuli in the valley of the Dnieper at Wasilkow,[1] in the government of Kiew, in which twenty-four gryphons, stamped in thin gold, along with glass beads, copper beads, and various other articles in gold and silver, have been met with. These gryphons probably passed northwards through the hands of the Greek traders of Olbia, along a route (Fig. 168, III.), to be examined presently, reaching from the Black Sea to the amber coast.

The Phœnicians and their Influence.

The great Semite merchants of the East, the Phœnicians, dwelling on the seaboard of what became ultimately the battle-ground between Egypt and Assyria,

[1] Kohn and Mehlis, *Vorgeschichte des Menschen im östlichen Europa*, 1879. Erste Band, pl. xi.

played, as we might have expected from their position and commerce, a most important part in the ancient Mediterranean world,—a part not unlike that played by their kinsmen, the Jews, in the Europe of the Middle Ages and of to-day. In the eyes of the early Greeks, the term Phœnician was almost the equivalent of trader. They were famous merchants before the seventeenth century B.C., since they are mentioned in the Egyptian records as importing vases, rings, rhytons, necklaces, perfumes, precious stones, and ivory, as presents to Thothmes III.[1] They not only traded with Egypt, but they built ships for the Egyptians. Their glass, amber, and metal work were famous among the Greeks, and their trade is proved to have extended through Palestine, eastward, as far as the Euphrates and the Tigris, by the metallic bowls with Phœnician inscriptions found in Babylonia and now in the British Museum. Their colonies were scattered far and wide over the Mediterranean, wherever there was a good anchorage for their ships and facilities for developing a traffic with the natives.[2] One of their most important colonies, Gades, Gadeira, or Cadiz, was founded at the mouth of a navigable river, the Guadalquivir, and at a place equally convenient for carrying on a coasting trade along the western shores of Spain and the north-western coast of Africa. It is said to have been founded not later than B.C. 1100.

The greatness of their chief cities, Tyre and Sidon, is most vividly brought before us on the bronze gates set up by Shalmanezar to commemorate his triumphs, and

[1] Chabas, *op. cit.* p. 120.

[2] See Butler, *Public Schools Atlas*, Map 3; W. Smith, *Atlas of Ancient Geography*, No. 9.

discovered by Mr. Rassam in the Mound of Ballawat, in 1877. On these gates is the record of the Tyrian and Sidonian tribute paid in B.C. 859.

"Here we see," writes a contributor to the *Standard*, "'rock-built' Tyre standing on a rugged island, at a short distance from the shore, and surrounded by a strong wall, with serrated battlements and gates with flanking towers. From the shore or mainland gate there slopes down to the sea a broad incline, down which two persons, male and female, evidently a representative couple, are bearing the objects of tribute to the ships. Between the mainland and the island we see represented the Phœnician vessels plying with the cargoes of offerings. These boats are long and narrow, with high bow and stern, both ends being fashioned alike,[1] and terminated in rams' heads. These boats, propelled by a sailor at either end with a broad-bladed oar, resemble very much the Levantine shore boats, or the Turkish *kayik*. One boat, retained in its place alongside the Tyrian quay by the boatmen, is just being loaded with bales of cloth, brazen bowls, vessels, etc., and trays containing ingots of precious metals. The freight is stowed in the centre of the boat, the heavier packages at the bottom, space being left for the free action of the rowers. A second vessel, which has received its cargo and is nearing the beach, is being dragged ashore by two sailors, who have tucked up their robes and rushed into the surf to draw the vessel up to the beach. On the main shore the artist has well represented the animated scene which was enacted. Porters and sailors are bringing up the tribute offerings from the ships, and are being arranged in line by the Assyrian soldiery, so

[1] Compare Fig. 165 with this description.

as to pass before the great king. On the beach are piled the bales of 'rich-dyed garments,' cloth and linen, and precious woods from distant lands. As we pass along the line we see other objects. Borne on small trays are numerous conical ingots of silver and gold, while in delicate baskets are carried gums and precious stones. We also see three men bearing aloft, as objects of precious value, huge brazen caldrons and baths,—objects which were much prized by the Assyrians as spoil or tribute, and which call to mind 'the brazen caldron unscathed by fire,' the prize in the Homeric chariot race. Here we see also the Sidonian bowls and embroidered garments. As we near the head of the procession, we come upon the merchant princes and nobles, who bear the homage and submission of Tyre. Each of them is attended by an Assyrian official, and the deputation is headed by a high military personage, who introduces them to the king. Standing somewhat forward from a brilliant staff of civil and military officials, we see the conqueror Shalmanezar. Clad in his richest robes of state, with a tiara on his head, the king receives the Phœnician deputation. In his hand he holds a bow and a pair of arrows, the emblems of submission tendered by the Tyrian princes, and he appears to be listening to the speech of the officers who head the procession. His head is shaded from the heat of the eastern sun by a rich embroidered umbrella held by an attendant eunuch—his bow, sword, and mace being held by the royal armour-bearer. In the rear of the royal staff of scribes, priests, soldiers, who must have presented a splendid sight in all their rich robes and jewel-encrusted arms, is placed a small detachment of the Royal Assyrian 'Horse Guards,' who ride at ease

beside the rich chariot from which the monarch has descended. Such was the group of Tyrian and Assyrian personages, and such the scene which, in B.C. 859, was to be seen on the shores of the Mediterranean, near the city of Tyre. How doubly interesting this picture is in giving, as it does, an illustration of the meeting of East and West, and portraying an event of great importance in the history of civilisation."[1]

The subjection of the Phœnician mother cities to the Assyrians is, as Mr. Stuart Poole[2] remarks, of the highest value in fixing the date of ancient works of art in the Mediterranean. Up to that time articles of Egyptian design were among the principal commodities in the Phœnician ships; afterwards they were replaced by articles made from Assyrian models.

The Phœnicians possessed no Art of their own.

The Phœnicians did not possess any art of their own,[3] but borrowed styles from other peoples—Egyptian, Assyrian, Persian, Lykian, or Greek. So much was this the case that the thirteen sarcophagi in the Louvre, which contained Sidonian nobles, are borrowed either from Egypt or Assyria. The king of Sidon, Eshmonezar, is buried in a sarcophagus made of stone from the Egyptian quarries of Syene in the Upper Nile, and he appears on the lid in an Egyptian dress, although the inscription proves that he was born, reigned, and died

[1] *Standard*, May 12, 1879. These bronze gates are now in the British Museum.

[2] *Contemporary Review*, Jan. 1878, p. 348 *et seq.*

[3] Renan, *La Mission de Phénicie*, Paris, 1864. Wiberg, *Archiv für Anthrop.* iv. 25.

in Phœnicia. We should have expected that this want of originality would have made itself felt least in things connected with commerce, and yet it betrays itself even there. The Phœnicians borrowed from Greek taste and Greek art even in their coins, and on a gold coin [1] from Carthage the head of a Greek god is to be seen with a Phœnician inscription. They first copied the Egyptians, then the Assyrians, and afterwards the successive rulers of the Mediterranean with whom they came in contact. The Phœnician "step" ornament is probably derived from an Assyrian source, and the habit of going to the animal and vegetable worlds for many of their designs is certainly due to the influence of their neighbours. It was indeed impossible, as Wiberg remarks, that in so small a territory as that of Tyre and Sidon any independent style of art could have arisen.[1]

The Phœnicians in the West.

The conquest of Phœnicia by the Assyrians, B.C. 859, was followed by an emigration to Africa of the rich and illustrious Tyrian merchants, who founded Carthage, according to Movers, about 814 B.C. The new emigrants, afterwards joined by another large body of citizens flying from the attack of Nebuchadnezzar,[2] caused the centre of Phœnician life and power to be shifted to the west.[3] The colonies in Sicily, Sardinia, North Africa, and Malta, acknowledged the supremacy of the new Tyre, and Gades and all its dependencies

[1] *Archiv für Anthrop.* iv. pl. 1, fig. 24.

[2] In B.C. 590. Movers, *Die Phönicier*, ii. 2, S. 133.

[3] In dealing with the Phœnician influence I have followed Wiberg, *Der Einfluss der klassischen Völker auf den Norden*, Hamburgh, 1867.

passed under its dominion. This dominion was so widely extended in Spain that no less than 200 towns are said to have been founded by them, some of which, such as Malacca, Carteja, Hispalis (Sevilla), still remain. The great mineral riches and natural fertility of the country caused a trade to spring up, and, as in the case of most of our colonies, the trade was rapidly followed by supremacy, which, if the Romans had been conquered, would have turned the Iberian peninsula into a Carthaginian province, and might have resulted in Carthage becoming the mistress of the world. The silver enabled them to make that metal a standard of value, and thus gave enormous facilities for traffic, while the tin and the copper gave them the materials for making bronze, used so largely in the Mediterranean trade.

The Spread of Phœnician Commerce to Britain.

The adventurous Phœnician mariners having established themselves in Spain, pushed their enterprises farther and farther northwards along the shores of the ocean. According to Pliny, Himilco[1] set out from Gades on his voyage of discovery about the same time that the Carthaginians sent Hanno to plant factories on the west coast of Africa, in B.C. 500.[2] He first rounded the Sacred Promontory (Cape St. Vincent), coasted along the shores of Lusitania (Portugal), and made for the harbour of the Artabri[3] (Bay of Corunna), passing

[1] Pliny, ii. 67. From Pliny's incidental notice it is obvious that the account of Himilco's voyage was extant in his time.

[2] B.C. 475, according to Sir G. C. Lewis, *Astronomy of the Ancients*, p. 450.

[3] Strabo, iii. c. 176; Meineke, vol. i. 239.

Cape (Finisterre) Nerium, where a chain of lofty mountains, formerly called Œstrymnis, rises perpendicularly from the sea. Thence he crossed the Bay of Biscay, and arrived at the islands of the Œstrymnides, "rich in tin and lead, and inhabited by a numerous, proud, and industrious population accustomed to commerce, and in the habit of going to sea in poor leathern boats (coracles). Thence he sailed two days farther to grass-green '*Insula Sacra*' (Ireland), inhabited by the races of the Hibernians."[1] These seas were visited by the sailors of Carthage and of Gades, who were in the habit of carrying on a trade with the natives. The voyage back from the Œstrymnides is described as follows:— "He who dares to steer from them into the open sea with a north wind lands on the green shore of the Ligurians," which may reasonably be taken to be the lower district of the Loire (Ligeris), or that district from which in later times intercourse was maintained between Cornwall and Massilia.[2] From this place the Œstrymnian Bay reaches as far as Ophiusa, the coast of which has the same extent as that of the Peloponnese, and from which it is a journey of seven days on foot to the Mediterranean or Sardinian Sea.

It is obvious, from this confused account, that we possess merely imperfect fragments of the records of the voyage. But even these prove that the Phœnicians were in the habit of trading with the natives of north-western Europe, as early as B.C. 500, and that they penetrated as far as the British and Irish Seas. The Œstrymnides are probably the same as the Cassiterides,

[1] Rufus Festus Avienus, *Poetæ Latinæ Minores*, ed. Le Maire, l. 80, Paris, 1825; *Oræ Maritimæ*, ed. Wernsdorf, v. 117, 383, 412; *Mon. Hist. Brit.* xix.

[2] Strabo, in *Mon. Hist. Brit.* vi.

or Tin Islands, of the later writers, which from Strabo's account are probably the Scilly Islands.[1] The name, however, may have included Cornwall and the tin districts of Wicklow in the south of Ireland, and it may also have been applied to those of Brittany. It is impossible that the early writers could have had accurate geographical knowledge of the various islands in so remote a sea. What little they knew they obtained from the narratives of sailors, unaccustomed to accurate observation, and unable to fix localities with the precision which is only rendered possible by the use of scientific instruments. Herodotus, writing in the year 450 B.C., with his valuable opportunities of collecting information, confesses his ignorance as to the position of the Cassiterides, whence the Phœnicians, and afterwards the Greeks, obtained their tin. Aristotle, living B.C. 345,[2] and with equal chances of obtaining accurate information, mentions Albion and Ierne[3] as being the two chief British Isles beyond the Celtæ, and is the first author who uses these names. We may therefore consider that the British coasts were visited by Phœnician traders in the fifth or sixth centuries before Christ; that merchandise from the south was at that time used in barter for the various products of our island, and that afterwards the Greeks had tolerably accurate ideas of the British Isles.

It is very generally supposed that the chief Phœnician supply of tin was derived from Cornwall, principally from the assumed non-existence of other regions in Europe[4] sufficiently rich in tin to have supplied the

[1] *Mon. Hist. Brit.* v.

[2] Aristoteles, *De Mundo*, c. iii.

[3] Ireland is termed Iris by Diodorus Siculus, and Ierne by Strabo.

[4] See pp. 402-7.

ancient world. We have already pointed out that it is widely distributed in the Iberian peninsula, where it was worked by the Phœnicians and the Romans, and that it was obtained in the Bronze age in Brittany, and worked by the Etruskans in Tuscany. It is very probable that the mines first worked by the Phœnicians were those nearest to Gades, and afterwards those farther away to the north of Lusitania and of Galicia, then those of Brittany, and lastly those of Britain and Ireland, the regions most remote from their influence.

The reader will see from the position held by the Phœnicians in the ancient world that they must have made known the arts and civilisation of the southern peoples among the barbarians living on the borders of the ocean. They must have exchanged the products of the Mediterranean for the metal, furs, and other articles of the natives. But their influence has left little evidence behind, because the metal-work which they brought bore nothing distinctively Phœnician about it. They manufactured articles for the various markets just as the cutlers of Birmingham make creases for the Malays, and peculiar hoes for the plantations in the West Indies, and just as the cotton-spinners of Lancashire suit their wares to the markets, and the calico-printers use one set of designs for Japan and another set for the trade of Asia Minor. They may have introduced into the west, and probably did introduce, vast quantities of swords, daggers, spears, glass beads, and other things; but these cannot be identified as Phœnician, because of the absence of a distinctive style. This view is materially strengthened by the reflection that their fleets navigated the western seas about 200 years before the Homeric times, the date of which is fixed by Mr.

Stuart Poole,[1] by the prominence of Egypt and the absence of reference to Assyria in the *Iliad* and *Odyssey*. In other words, they were on the Atlantic during the legendary time when the use of iron was superseding that of bronze, and when they were supplying the Greeks with both those metals. But they probably did not introduce iron into the west till it became comparatively cheap in later times. Professor Nilsson[2] extends their influence as far as Scandinavia, and believes that they were the introducers of the civilisation of the Bronze age. I am, however, unable to meet with any traces of their presence as far north as Scandinavia.

The Phœnicians were the first of the southern peoples who can be proved to have had direct intercourse with Britain, but that intercourse could not have been very extensive. No tombs or other remains distinctively Phœnician have been discovered in any part of the British Isles. Certain gëographical names, however, in Cornwall are considered by Dr. Wiberg to be those given by the Phœnician sailors. The river Tamar,[3] and the town Tamaris (Tamerton), (tamara=an exchange), recalls to mind the river Tamaris in Galicia. Uxella (? Bridgwater)=fort, town, village, is the same word as the Sardinian Usellis, and the Maltese Casale; and the promontory of Herakles (Hartland Point) and the island of Herakleia (Lundy), probably owe their names to the worship of Herakles (Melkarth), which was carried on in most of the Phœnician settlements on the shores of the Mediterranean.

[1] *Contemporary Review*, Jan. 1878, p. 357.

[2] *Die Ureinwohner des Scandinavischen Nordens. I.* Das Bronzealter.

[3] Wiberg, *Der Einfluss der klassischen Völker auf den Norden.* Hamburg, 1867, p. 13.

The Phœnicians carried on commerce also with Gaul from their colonies in the south, such as that of Herakleia at the mouth of the Rhone, and in the Greek city of Massilia they were sufficiently numerous to possess a temple dedicated to Melkarth. Punic coins are found in the south of France, and those of the Punic colonies in Sicily occur in Italy, and have been discovered in the pass of the Great St. Bernard, pointing out unmistakably the direction taken by their commerce.[1]

The Etruskans and their Influence.

The people known to the Latins as the Etruskans are considered by all writers, however much they may differ as to their origin, as "a mixed race composed partly of the earlier occupants, partly of a people of foreign origin who became dominant by right of conquest, and engrafted their peculiar civilisation on that previously existing in the land."[2] Among the earlier inhabitants the Pelasgi are the most important, considered by Mr. A. S. Murray[3] as the common forefathers of the ancient Greeks and the Etruskans. His view is supported by the similarity of works of art found in Mykenæ, Palestrina, and the Regulini tomb at Cære, as well as by the Cyclopean polygonal masonry named after them in Greece and Italy.[4] Their peculiar architecture is found also in the islands of the

[1] For lists of discoveries of Punic remains see Wiberg, *Der Einfluss der klassischen Völker auf den Norden*, pp. 82, 83.

[2] Dennis, *The Cities and Cemeteries of Etruria*, 2d edit., 1878, 2 vols. 8vo. In this paragraph I have mainly followed the views of this author.

[3] *Encycl. Brit.*, article Etruria.

[4] Cosa, Tarquinii, Agylla, Volterra, Saturnia, Alsium, Pisæ, in Etruria, Mykenæ, and Thessaly, and Epirus in Greece. For an account of the masonry see Dennis, ii. p. 255.

Ægean and on the coasts of Asia Minor. They probably entered Italy by way of the valley of the Danube, and over the Alpine passes. To them Castellani refers the beautiful work in gold and silver as yet unrivalled by the jeweller of modern times.

The second element in the Etruskan population is that known to foreigners as the Tyrrheni, or Tyrrseni, Etruski, Tusci, to themselves as the Rasena, who established themselves in Italy, according to Otfried Müller, about 290 years before the foundation of Rome, or in B.C. 1044. Their date is carried by Niebuhr as far back as B.C. 1188. Long before this, however, they are proved to have been a naval and a military power in the Mediterranean, by their invasion of Egypt in the fifteenth century. They are universally considered to have come from Asia Minor, most probably from Lydia, and their Asiatic origin is proved by their manners and customs, their religion and their art. According to Niebuhr and Mommsen, they arrived in Italy from the direction of Rhætia, according to Dennis they occupied southern Italy first, and gradually pushed their way northwards. The precise relation of the Pelasgi to the Rasena and to the Umbrians is uncertain, and at this distance of time it is impossible to define with accuracy all the ethnical elements in the Etruskan people.

The Etruskan civilisation was largely influenced by the art of Egypt and Assyria. Sphinxes, gryphons, chimæras, scarabæi, four-winged demons, and the like, show its eastern lineage. The tombs cut in the rock, and the habit of depicting various scenes in them, reminds us of the banks of the Nile, and the rock-hewn sepulchres of Lykia; and the Egyptian influence is felt in such minute details as the dressing of the hair in curls,

and the use of the lotus pattern. At a later time they were intimately associated with the early Greeks, and to such an extent was the intercourse carried on between them that Greek vases and statues abound in their tombs, and the terra cotta sarcophagi, in which rested the ashes of the Etruskan nobles, were copied from Greek designs. After an examination of the principal collections in Italy, it seems to me probable that there were Greek artists in the principal Etruskan cities, who carried on the business of modelling and designing, in the same fashion as the Italians of the present day carry on the manufacture of plaster casts over the whole of Europe. The Greek influence, however, is scarcely perceptible in the metal-work, which was allowed by the early Greeks themselves to be of remarkable excellence. Etruskan candelabra[1] were famous in Athens in the days of Perikles. Pheidias gave his Minerva sandals of Etruskan fashion; and various articles in gold and bronze were imported for the use and ornament of the houses of the Greeks. The metal-work of the Etruskans was as widely distributed in ancient Greece[2] as the Greek vases and statues were distributed throughout the Italian dominions of the Etruskans. The commerce between the two was considerable, and before the invention of coins was carried on by means of barter. Nor did the reputation of the Etruskans for metal-work diminish in much later times after their conquest by the Romans. We read in Pliny that their works of art were to be found throughout the world.[3]

The Etruskans appear before us in the earliest records

[1] Dennis, *op. cit.* i. p. lxxiv. [2] Athenæus, i. c. 50.

[3] Pliny, xxxiv. 7, 16, 1. Signa Tuscanica per terras dispersa quæ in Etruriâ factita non est dubium.

as a nation sufficiently powerful to carry on war against Egypt, then the mistress of the Mediterranean world, and their commerce reached far and wide. They worked the iron mines of Elba, and the copper and tin mines of Tuscany, which were to them a source of wealth like the silver of Laurium to the Athenians, and the gold of Philippi to the Macedonians. They had the staples of their metal industry within their own borders, and in exchange for their manufactured bronze articles they received wealth from far distant regions, from Greece, Assyria, and Egypt, and from north Africa. Sapphires from the remote east found their way to them, as well as amber from the far north.[1]

They were formidable rivals of the Phœnicians on the seas, and proof of their intercourse is given by the articles of Phœnician workmanship found in their tombs, such as the silver dish in the tomb at Palestrina,[2] and the glass bottles in the cemeteries of Bologna.[3]

The Etruskan power in Italy formerly extended from Vesuvius and the Gulf of Salerno as far as the Alps, and from the Tyrrhenian to the Adriatic Seas; and the statement by Livy that they formerly occupied Rhætia is proved by recent discoveries of their remains north of the Alps. Innumerable articles of Etruskan workmanship in the cemeteries of Hallstadt[4] prove also that their

[1] The reader may be referred on these points to Dennis, *Etruria;* to Canina, *l'Antica Etruria Marittima;* to the *Monumenti Inediti dell' Instituto;* and Gozzadini, *Intorno Agli Scavi Archeologici fatti presso Bologna;* and to the museums at Bologna, Florence, and Rome.

[2] Phœnician articles with inscriptions have been discovered in Etruskan tombs at Palestrina (Dennis, *Etruria*, ii. 449), and at Præneste, *Mon. Inedit.* 1876, x. tav. 33.

[3] To be seen in the Museo Civico, Bologna.

[4] See Von Sacken, *Das Grabfeld von Hallstadt.* Ramsauer, *Hallstadt der am Salzburge aufgefunden MSS.* For the use of this valuable work I am indebted to Mr. John Evans.

civilisation extended as far down into the Valley of the Danube as the district of Salzburg. They probably worked the salt-mines of the whole of that region. They are said also to have been masters of Corsica, and to have founded Tarraco near Tarragona in Spain.

The Etruskans were famous not only for their bronze work, but also for their amber, and the chief port in which the amber trade was carried on with the ancient Greeks was the city of Hatria, on the north of the mouth of the Po (Eridanus), which gives its name to the Hadriatic, from the waters of which it is now separated by a barrier of silt upwards of fourteen miles in width. The routes by which the amber was conveyed to it from the shores of the Baltic have been satisfactorily ascertained by the finds of amber, as well as by the discovery of articles of Etruskan workmanship in various parts of Germany.[1]

The Etruskan Trade-Routes to the Amber Coasts.

The two most important, as well as the oldest, trade-routes leading to the amber coasts are those starting from Hatria, and leading through the Alpine passes into the Valley of the Danube. The first, I. of map (Fig. 168, I.), took the line of the Valley of the Adige past Verona, Roveredo, and Trient, over the Brenner Pass into the Valley of the Inn, and crossed the Danube either at Linz or Passau. Thence it passed over the Bohemian

[1] The principal authorities consulted in dealing with the trade-routes of the Etruskans and Greeks are Wiberg, *Der Einfluss der klassischen Völker auf den Norden durch den Handelsverkehr*, 8vo, Hamburg, 1867; Pierson, *Elektron*, Berlin, 8vo, 1869; Genthe, *Uber den Etruskischen Tauschhandel nach dem Norden*, 8vo, Frankfurt, 1878; Von Sadowski, *Die Handelsstrassen der Griechen und Römer*, 8vo, Jena, 1877.

Mountains into the Valley of the Elbe, and made for the amber coast of Schleswig and Holstein. It was probably

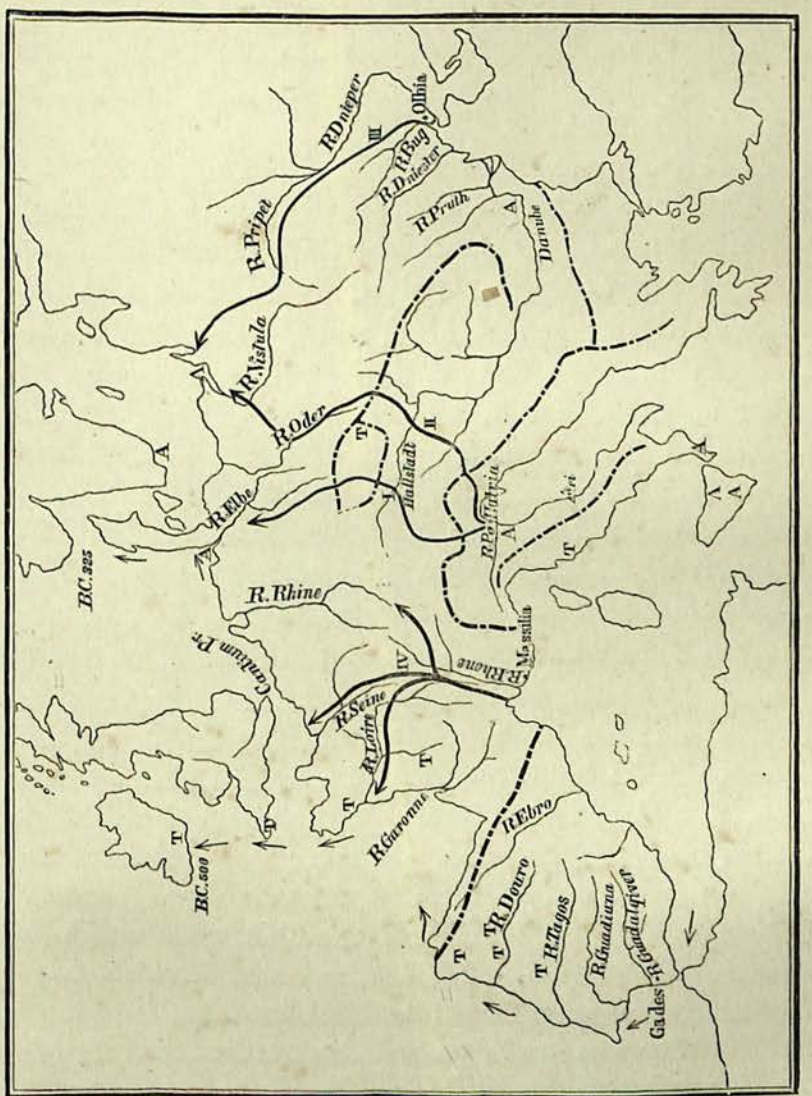


FIG. 168.—Map showing the principal Trade-routes (I. II. III. IV.) from the Mediterranean, and the Distribution of (T) Tin and (A) Amber.

also connected with that passing up the Danube and down the Valley of the Rhine, as well as with that which crossed the Danube lower down at Presburg (Carnuntum).

The second or eastern route, No. II. of map, runs by Trieste by way of Laibach, Gratz, and Bruck, and across the basin of the Leitha to Presburg, and from thence to the line of the Upper Oder, past Breslau, to the Lower Vistula, to Elbing, and ultimately reaches the amber coast of Samland.[1]

These two lines of traffic were used not merely by the Etruskans, but also subsequently by the Romans, and are marked by the discovery of amber from the north, as well as articles derived from the south in the tombs in their neighbourhood, and by them the Mediterranean markets derived their principal supply of amber at the dawn of history. The ancient Greeks confounded the Hadriatic ports, whence the amber was shipped off to them, with the country where it was found, and Herodotus tells the story current in his time that a river[2] Po flowed into the northern ocean not far from the Amber Isles, with the remark that his information was second hand, and that he had never seen any one who had visited those islands. The story is, however, true in its main points, that the amber of the ancient Greeks was discovered in northern Europe, and that it made its appearance in the civilised world at Hatria, near the mouth of the river Po, without reference to its conveyance through the country separating Italy from the North Sea and the Baltic, of which it was very unlikely that Herodotus could have obtained accurate information from the Greek traders.

The Etruskan trade passed also northwards through Switzerland into the Valley of the Rhine as far as its

[1] For lists of Etruskan finds in Bohemia, see Genthe, *Ueber die Etruskischen Tauschhandel nach dem Norden*, 8vo, 1874, pp. 150-1.

[2] Herodotus, iii. 115.

mouth, and found its way also through various Alpine passes, and by the Mediterranean into France.[1] In both these countries the safety-pin brooch, and weapons and ornaments of Etruskan derivation, occur in the late Bronze and early Iron ages.

Traces of Etruskan Influence north of the Alps.

Hallstadt[2] occupied a most important position on the right of Route I.; and from it a trade in salt from the salt mines must have been carried on both with the north and with the south. It was also a centre from which the Etruskan metal-work would be conveyed, on the one hand, up the Danube into the Valley of the Rhine, and, on the other, in the direction of Presburg, and into the Valley of the Elbe. The direction which this commerce took is proved by the numerous discoveries of Etruskan weapons, *rëpoussé* work in bronze and gold, and various designs, met with in those regions. The commerce found its way farther and farther north, until ultimately the Etruskan articles and patterns arrived in Britain. The dagger[3] found in the river Witham is of the same design as a sword figured by Ramsauer from the cemetery at Hallstadt; the golden armour found at Mold (Figs. 159, 160) presents the same patterns as the metal-work found at Hallstadt, and in Etruskan tombs at Veii, Corneto, and Prænestе.[4] The

[1] *Matériaux*, 1877, p. 531 ; 1878, p. 403 ; 1870, pp. 34, 273, and p. 402.

[2] Von Sacken, *op. cit.* Ramsauer, *op. cit.* *Matériaux*, 1877, p. 409, 1878, pl. ix.

[3] Kemble and Franks, *Horæ Ferales*, pl. xvii. fig. 2.

[4] *Archæologia*, xxxvi. p. 350 *et seq* ; xli. p. 216 *et seq.* *Mon. Inedit.*, 1874, x. tav. 10.

golden cap (Fig. 157) found in Ireland is similar to those found near Poitiers in France, and in the Valley of the Rhine, figured by Lindenschmidt; it is also of the same design as some of the gold cups found in Denmark (Fig. 151) and Scania.[1] In all these the workmanship is identical with that of the Etruskans.

The Etruskan influence is proved by many discoveries,[2] such as the peculiar vase-carriages in Scania, and the cinerary urns of bronze in North Germany, to have extended as far to the north as Sweden, and to the east as the Lower Vistula. The cinerary urns have been found in association with articles of iron, and with amber beads, in tombs of the Iron age.

Etruskan weapons and designs have also been discovered in Denmark; the axes, for example (Fig. 148), are identical in type with those represented on the frescoed wall of the great tomb at Cære. The shields also, such as Fig. 150, are, if not of Etruskan origin, modelled on Etruskan designs. Some of the Danish swords, with hilts *à trois cordons*, are identical with those found in Italy.

The ancient Etruskans of Bologna and Hallstadt, and in the older tombs of Cære, were in the state of transition between bronze and iron. Bronze swords and axes were most common, and iron was comparatively rare, and so much more valuable than bronze, that one of the bronze celts, discovered in a tomb at Bologna, had

[1] Worsaae, *Primeval Antiquities*, p. 36. Montelius, *Congr. Int. Archéol. Prehist.*, Stockholm, p. 505.

[2] See *Archæologia*, xv. 128; xli. pl. 4; xlii. p. 488. Lindenschmidt, *Die Alterthümer unserer heidnischen Vorzeit.* Engelhardt, *Congr. Int. Archéol. Préhist.*, Copenhague, p. 403. Mestorf, *Congr. Int.*, Buda-Pesth, p. 686. Virchow, *Matériaux*, 1877, p. 233, and *Archiv für Ethnologie*, *passim.*

a thin edge of iron let into it. It may therefore be inferred that they imported articles of bronze long before articles of iron in their traffic with the peoples to their north. What then was their position in relation to the Bronze and Iron ages north of the Alps? It may be concluded from the distribution of their weapons and designs, and copies of their designs, through France and Germany, that they carried on a commerce with those countries during the late Bronze age, while their influence in Britain is only clearly marked in the Iron or the late Celtic age. In Scandinavia their influence was felt during the greater portion of the Bronze age.

The Downfall of the Etruskan Trade.

From the facts recorded in the previous pages it is clear that the Etruskans in remote times were a highly civilised and powerful confederation, sweeping the Mediterranean with their fleets, having free intercourse with all the civilised peoples of the south, and exercising a great influence on the barbarians on their northern frontiers. From their commanding position, it was inevitable that they should be the principal means of spreading the Mediterranean civilisation in Germany, France, and the regions of the north. This position was lost by the attack of the Romans on the one hand, and of the Gauls on the other. The rise of the Roman power corresponds with the decay of Etruria, and is to be looked upon as the natural growth of the one people out of the other. It is clear from the history of the struggles carried on between Rome and the Etruskan cities, that the Etruskan peoples lived on as Romans, and contributed, in no small degree, the qualities which made

Rome the mistress of the world. Their conquest by the Gauls was altogether different.

In B.C. 396 the Gauls poured through the passes north of Lugano into the Valley of the Ticino, defeated the Etruskans in a pitched battle, burnt Melpum, and, being joined by other bodies of their countrymen, took possession of Lombardy, from that time forward known to the Romans as Gallia. Six years later they defeated the Romans in the battle of the Allia, sacked Rome, and were only kept on the north-eastern side of the Apennines by the ceaseless vigilance of the Romans.

This invasion of Lombardy by the Gauls broke up the trade-routes of the Etruskans. Hatria was destroyed, and a new Hatria established, probably by the survivors, on the shores of Picenum, which afterwards became a Greek city, the modern Atri. The condition of the Etruskans in Rhætia and the surrounding districts, cut off from Etruria by the hostile barrier of Gauls, was probably analogous to that of the Britons cut off by the Gothic invasion from the Roman Empire. Their arts and civilisation declined, although they preserved their speech as late as the days of Livy. The Etruskan influence on the north, which had lasted for many centuries, came to an end in the fourth century B.C., and trade did not find its way again along the old channels until the conquest of Cis-Alpine Gaul by the Romans and the spread of the Roman power to the north.

The interruption of this traffic led to the development of new channels, by which the influence of Greece penetrated into the countries of the north.

The Greeks and their Influence.

The history of Greece began, according to Grote, in B.C. 776; and in the days of Homer, who is stated by Herodotus to have lived B.C. 880, the Greeks possessed no money, were ignorant of the art of writing, and were acquainted only with the western parts of the Mediterranean.[1] In the Homeric times iron was beginning to be used in place of bronze, and both materials were employed for weapons. The influence exerted by the early Greeks on the nations of the north and west was principally from the colonies on the north of the Black Sea, and from that of Massilia.

The Trade-Route from Olbia.

The Greek colonists, who introduced their arts and civilisation into the district north of Pontus, gradually pushed their discoveries farther and farther to the north-east, and ultimately arrived by a new route at Samland. They started from Olbia, at the mouth of the river Bug, passed up the Dnieper, and thence in a north-westerly direction, so as to avoid the huge morasses which bordered most of the rivers traversing these great plains, made for the line of the Lower Vistula, and joined the main line of commerce from the Hadriatic Sea. The rivers also were a means of communication, as well as the roads through the forests, which are marked by the numerous tumuli and many traces of old occupation between Kiew and the Lower Vistula (see Fig. 168, Route III.)

[1] The ancient inhabitants of Hissarlik and Mykenæ appear from Dr Schliemann's discoveries to have lived in the Bronze age.

The relative antiquity of the routes from Olbia and Hatria is ascertained with tolerable precision. Herodotus, in the course of his travels, visited Olbia, and from his silence as to the existence of an amber trade, coupled with the belief to which he alludes of its being obtained from the mouth of the Po, it may be concluded that Greek discovery at that time had not penetrated to the amber coasts of the Baltic by way of Olbia. Coins, however, of that city, as well as other Greek coins, have been discovered at Schubin,[1] near Bromberg, belonging to the fifth century before Christ. These are likely to have passed northwards from Hatria, which, in the days of Herodotus, was a mart frequented by the Greek merchants. It is not until after his time that the trade-routes from Olbia are clearly defined by the Greek helmets, armour, and coins found near the source of the Tasmina, and by other Greek remains,[2] and by amber in various places between the Baltic and the Black Sea. The development of this route was probably hastened by the disturbance of the old one from the Hadriatic by the Gauls, who not only conquered Lombardy at the beginning of the fourth century before Christ, but also ravaged Greece B.C. 279. These movements must have seriously affected all the trade-routes passing across the line of the Danube to the amber coasts.

The Greek influence penetrated into the Valley of the

[1] Von Sadowski, *Die Handelsstrassen der Griechen und Römer* aus dem Polnischen, von Albin Kohn, Jena, 1877, p. 72, pl. iii. figs. 1-6. Coins of Olbia and Ægina, with the "Quadratum incusum" of Athens and of Cyzicus, found together at Schubin, ranging in date from B.C. 460 to 431.

[2] Silver coins of Demetrius Poliorketes (B.C. 294-287), found in a tomb at Peterskapelle, close to the Gulf of Riga. For other cases see Engelhardt, *Congr. Int.*, Buda-Pest vol., p. 251 *et seq.*

Danube through the mountains to the north of Greece, as well as by way of Olbia and Hatria. The coins of Philip of Macedon have been found in Germany, and those of Massilia at Roveredo on Route I. It is very likely that some of the beautiful designs so conspicuous in the arms and ornaments of the Bronze age in Scandinavia, which up to the present time have not been traced farther south than the Valley of the Danube, may have been derived from Greece. It must be borne in mind that just as amber from the north was distributed through Italy and Greece, so in return were bronze articles and glass beads exported to the regions of the north. The influence, however, of Greece and of Greek art seems to me altogether secondary in importance to that of the Etruskans, who carried on trade with the north most likely for many centuries before the Greeks of Pontus found their way to the shores of the Baltic.

The Trade-Route from Massilia.

In the seventh century before Christ the Greek sailors appeared in the western Mediterranean to dispute the supremacy of the seas with the Phœnicians and Etruskans. Kolaios,[1] a native of Samos, was driven by a storm in B.C. 640 out of his course beyond the Pillars of Hercules, and was the first of all the Greeks to reach Gades or Tartessus; and about one hundred years later the Phocæans, fleeing from the tyranny of Cyrus, founded the city of Massilia at the mouth of the Rhone, which rapidly became an important place of commerce, and exerted a great influence on the civilisation of Gaul and of Britain. They introduced the Greek language and

[1] Strabo, iv. 150.

writing, the Greek cultivation of the vine, Greek manufactures, and the newly-discovered art of striking coins from metals. This coinage has been traced through Gaul into Britain, in the Iron age (see pp. 436-9), as well as over the whole of the area from Bohemia to the mouth of the Rhine, and it penetrated into northern Italy.

The introduction of stamped money marks an important change in the commerce of the world. It had passed from its first simple condition of being an exchange of goods, to a second and more highly-organised stage—that is to say, an exchange of goods for metal, which, instead of being weighed, was furnished with a stamp marking its true value. The earliest coins are those of Pheidon of Ægina, *circa* B.C. 660, or of the Lydians in the reign of Gyges, B.C. 700. A coinage of bronze was introduced into Rome in the reign of Numa or Servius Tullius, of silver in B.C. 269, in the First Punic war, and of gold about sixty years afterwards.[1]

The main routes of this commerce are clearly defined by Strabo and Diodorus Siculus. The caravans passed from Massilia up the Rhone (see Route IV. of Map, Fig. 168), down the Valley of the Loire and of the Seine, and up that of the Saone into the Valley of the Rhine. The two first of these, according to Diodorus Siculus, were used for the trade with Britain; and the last was directed towards the amber of Schleswig and Holstein, from which probably the greater portion of the precious commodity was obtained. It may, however, have been partially derived from Samland. It is said to have been collected by the Gutones or Jutes, and to have been sold by them to the Teutones, through whom it passed into the hands of the Massilian traders.

[1] Lubbock, *Nineteenth Century*, Nov. 1879, p. 789.

The Voyage of Pytheas.

We have seen that in the year 500 B.C. the exploration of the Northern Seas had advanced as far as Cornwall and Ireland by Himilco and the Phœnicians. The opening up of the English Channel and the North Sea was due to the Greeks of Massilia. About the year B.C. 325 an expedition was fitted out to explore the far north under Pytheas, an eminent astronomer and mathematician. He set sail from Massilia, and passing through the Pillars of Hercules, coasted along the shores of Spain and of western France to Cape Calbium (Point du Raz), and the island of Uxisame (Ushant) off the coast of Brittany. Thence he passed northwards to the British coast, and sailed along the shores of the southern counties until he entered the Straits and arrived at the promontory of Cantium (the North Foreland). He is said to have spent some time in Britain. He then followed the English coast northwards, and leaving it after a voyage of six days discovered Thule (Norway), which he naturally took to be an island, the most northern of all countries, surrounded by a sea frozen into slush, which rendered farther advance impossible. He tells us that in the regions about Thule,[1] at the time of the summer solstice, there is half a year of day; but this probably refers to his own speculations, since he was not six months in the region.

[1] Wiberg takes Thule to be Jutland; but from the fact that Solinus (A.D. 80) mentions the Hebrides as being two days' sail from the Caledonian headland "in the direction of Thule," while the Orcades are five days' sail from Thule, it cannot be other than Norway. The "sea-blubber" of Pytheas is the peculiar soft slush which the sea-water becomes at the beginning of winter in the Arctic regions.

Pytheas turned back southwards from Thule,[1] and reached the mouth of the Rhine and the nation of the Ostiæans. He then steered north-east for 6000 stadia (150 geographical miles), along the broad gulf Mentonomon, probably the bay between North Holland and Jutland, and discovered the Amber Islands, or Electrides referred to by later Roman writers, among which Abalus, termed afterwards by the Greeks Baltia, is likely to be one of the islands off East Frisia or Schleswig. A large river which he termed the Tanais, probably the Elbe, opened on the shore. After about a year's absence the expedition returned to Massilia.

From this account it may be concluded that Pytheas steered as far into the North Sea as Norway. That he arrived in Jutland is rendered certain by the position assigned to the Amber Isles, and to the Guttones, whom he describes as living on the coast. The discredit which has been thrown upon his narrative by ancient and modern criticism seems to me,[2] as it does to Sir John Lubbock,[3] wholly undeserved. His discoveries are to be viewed not as standing alone, but as the inevitable result of the increased trade and commerce with the north. Himilco's voyage first indicated the position of Britain and Ireland, and to Pytheas is the merit due of opening out the British Channel and the North Sea to the ancients. Each of these explorations forms a link in the chain of geographical discovery by which the shores of northern Europe and Asia have been made known, and which has been so successfully terminated

[1] Wiberg, *Einfluss der klassischen Völker*, has been my principal guide in the narrative of Pytheas.

[2] Polybius, Strabo, and Cornwall Lewis.

[3] *Prehistoric Times*, 4th edition, p. 66.

in the year 1879 by the expedition under the command of Professor Nordenskiold.[1] Thule was considered an island by Ptolemy and the later Greek and Latin writers, and its true relation to the mainland of Europe was not known before the fifth century after Christ.

It is unnecessary for us to inquire into the Roman influence on the nations of the north, since it was felt in this country only at the beginning of the Historic period. As the Roman power gradually mastered the Phœnician, Etruskan, and Greek, Roman coins and merchandise passed along the old routes to the north, which remain the great highways of commerce to this day. The discoveries of Pytheas were followed by those of the Roman navigators, and in the first century after Christ the British Isles, the Hebrides, and the Orkneys were known to the geographers.

General Conclusions.

The preceding pages offer us the materials for arriving at a just idea of the condition of Europe at the beginning of history. The civilisation of Egypt was being felt in the Mediterranean area before the fifteenth century, and the Assyrian by the tenth century before Christ, but the influence of these, spread principally by the Phœnicians, was not known beyond the Pillars of Hercules before the twelfth century. Then the Phœnicians pushed as far as Gades, and gradually extended their trade along the Atlantic until it arrived in Britain in the fifth century before Christ. The Etruskans became masters of Italy at least one thousand years before Christ, and

[1] The objection urged by Polybius, that Pytheas' narrative is untrue because he was a scientific man incapable of supporting the expense of an expedition, applies equally to Professor Nordenskiold.

carried on trade as far as the Baltic and the North Sea, and Etruskan articles found their way into France and Switzerland in the Bronze age, and into Britain and Ireland in the Iron age. This continued until the irruption of the Gauls. Then the Greek trade arose, and Greek articles and coins found their way to the Baltic as early as the fifth century before Christ, and to our country in the Iron age, in the second century before Christ.

The Phœnicians may be assumed to have worked the tin mines of Cornwall before the arrival of the Massilian traders, since they knew of their existence in the time of Himilco, and since several names of places are probably of Phœnician origin. They must also have used bronze and glass in their trade, but their wares manufactured for the northern markets do not present any characters by which they can be known. The Etruskan influence appears to me to have been more powerfully felt north of the Alps than any other, and it was probably exercised quite as long, if not longer, than that of the Phœnicians.

When we reflect that the history of Gaul begins in the seventh, and that of Britain in the first century before Christ, and when we consider further that the civilisation of Egypt dates back to more than 4000 B.C., it must appear obvious that the historical overlap is very great. It is very probable that a large portion of northern Europe was in the Neolithic age while the scribes were compiling their records in the great cities on the banks of the Nile, and that the Neolithic civilisation lingered in remote regions while the voice of Perikles was heard in Athens, or the name of Hannibal was a terror in Italy.

CHAPTER XIV.

BRITAIN IN THE HISTORIC PERIOD.—CONCLUSION.

The Exploration of the British Coasts.—Physical Geography and Climate.—Population at the time of the Roman Conquest.—Roman Britain.—The English Conquest.—The English Breed of Cattle.—The Extinction of the Larger Wild Animals.—Conclusion.

The Exploration of the British Coasts.

WE are now in a position to realise the condition of Britain at the time when its history began, which may conveniently be taken to be the invasion of Julius Cæsar (B.C. 55). The British Isles, first known to the civilised nations of the Mediterranean through the memorable voyage of Himilco, were visited by the Phœnician traders from that time forward, and the tin of Cornwall became famous in the marts of the south. The Phœnicians, however, only explored the south-western parts of Britain and Ireland. The east and north-eastern coasts were opened out by Pytheas, and a commerce was developed overland between Massilia and Cornwall along the routes already described in the preceding chapter (Fig. 168). The Greeks of Massilia were also acquainted with Ireland. The poet Avienus, writing while Himilco's narrative was preserved, terms Ireland "*Insula sacra*," which is evidently a translation of

the mistake made by the Massilian Greeks in confounding the Ἶρις of the sailors with *ἱερά νῆσος*,[1] the island of the West (Erse, *iar* or *eir*, Thurnam[2]) with Holy Island. After the invasion of Cæsar the attention of the geographers and historians was directed to the British Isles, and in A.D. 84 their circumnavigation was completed by a Roman fleet under the command of Agricola, which subdued the Orcades (Orkneys). The northern coast of Scotland had, however, been visited before 44 B.C., since Diodorus Siculus mentions the promontory of Horca (Dunnet Head) as the northern extremity of the island. The whole of the British Isles, with the exception perhaps of the Faröes, were well known by the year 120,[3] and there was no necessity for the further exploration of the coasts.

Physical Geography of Britain.

Britain, at the beginning of the Historic period, differed considerably from the Britain of to-day, although there is no reason to suppose that any vertical movements have altered the relation of sea to land. The dash of the waves for the last nineteen centuries has destroyed large tracts of land where the cliffs are composed of soft and incoherent materials. The inroads of the sea on the south coast have been so great in some places, such as Pevensey and Pagham, in Sussex, that it is by no means improbable that the Isle of Wight may have been united at low water to the adjoining coast during the Roman occupation.[4] Large tracts of

[1] Dr. Latham, *Smith's Dictionary of Greek and Roman Geography.*

[2] *Crania Britannica*, i. p. 64.

[3] Claudius Ptolemæus, *Geographia*, Mon. Hist. Brit.

[4] It was an island in the days of Claudius. Suetonius, *Mon. Hist Brit.* 1.

land also have been destroyed on the coasts of Lancashire and Cheshire, and on those of Essex, Norfolk, and Suffolk. In other places great additions have been made to the land by the accumulation of sand, shingle, and mud. The island of Thanet is now joined to Britain by fertile meadows; and Romney Marsh, and the large tracts of shingle at Dungeness and Rye, have been formed for the most part since the Roman Conquest. Great accumulations of alluvium have been formed in the lower parts of our larger rivers, and large areas in Lincolnshire and in Essex have been reclaimed from the waves by the hand of man. The creation of new and the destruction of old land may be taken to neutralise one another, so that Britain at the beginning of the Historic period was probably about as large as it is now. It is very unlikely that an island then occupied the site of the Goodwin Sands, as is asserted by tradition, for it is incredible that it could have escaped the notice of Ptolemy, who has given such a minute description of the coasts and islands.

The rainfall at the beginning of the Historic period in Britain must have been greater than it is now, because of the large extent of forest and morass, and the fogs and mists[1] more often intercepted the light of the sun. In other respects the climate was more temperate than on the Continent, and with its extremes far less marked. It was warm enough in the south for the vine, but too cold for the olive.

The surface of the country was densely covered with trees. In the south the Anderidan forest extended over the greater part of Kent and Sussex, and into Wiltshire

[1] The fogs are generally mentioned in the accounts of Roman Britain. See *Mon. Hist. Brit.* vii., etc.

and Hampshire; in the north the Caledonian overshadowed the region of the Grampians; and in the middle there was the wild region of the Pennine hills. Morasses bordered most of the principal rivers and streams. Wild animals were sufficiently abundant to allow of a trade being carried on in furs with merchants from Gaul. There were bears, wild boars, wolves, and foxes, in the forests; stags and roe-deer in the glades; beavers[1] in the rivers; and bustards were numerous on the south-eastern downs. In the north of Scotland the reindeer still survived, and was hunted by the inhabitants of Caithness, who lived in the circular stone "burgs" or "broughs."[2] The dogs used by the British hunters soon became famous in Italy.[3]

The dwellings consisted of small circular huts, made of wood or wattles, or of stone, which were sometimes protected by a stockade of timber in the woods, or by the ramparts which had been inherited from the former Neolithic inhabitants of the country. They were connected with each other by narrow tracks sufficiently wide to allow of the passage of a small horse, or sometimes of a chariot. These tracks are still to be seen in many parts of the country, and are remarkable for their irregular, winding course, so different from the wide, straight Roman road to be seen in many places close by.

[1] For evidence as to the animals see my *Preliminary Treatise*, Palæont. Soc. 1878, cii.

[2] Laing and Huxley, *Prehistoric Remains of Caithness*, 8vo, 1866. Dawkins, *Pop. Sc. Rev.* 1868: "The Range of the Reindeer." For an account of these circular buildings see Wilson, *Prehistoric Annals of Scotland*, ii. 338 *et seq.*

[3] Strabo, *Mon. Hist. Brit.* vi.

Population at the Time of the Roman Conquest.

The inhabitants were numerous, collected together into villages and towns, and governed by chiefs frequently at war with each other, who consequently fell an easy prey to the Romans. They subsisted principally on their swine, small short-horned cattle, and horned sheep, and to a lesser degree on their crops of wheat and barley. They brewed beer from both of these, and used honey for making mead. The tribes of northern Britain in the time of Agricola, A.D. 80, were pastoral and ignorant of agriculture. Under the Roman power the land rapidly passed under the plough in southern and eastern Britain, and in the days of Julian[1] sufficient corn was grown to freight eight hundred ships, by which it was carried to the mouth of the Rhine. The corn was cut off close to the ear, or, according to Pytheas, collected in sheaves, which were thrashed in large buildings,[2] roofed over for protection against the ungenial climate. It was stored in subterranean granaries.

The personal appearance of the Britons of the southern counties is described by the Roman writers as follows:—The hair was worn long, and sometimes the beard and whiskers were shaved. The dress consisted of Gaulish trousers, and a tunic with a belt, almost like a Norfolk jacket, over which was worn a plaid, fastened with a brooch. It varied in thickness according to the season, and was of different colours, and sometimes

[1] On the authority of Zosimus (*circa* A.D. 500).

[2] This statement was so strange to Strabo, accustomed only to the open threshing-floors of the south, that it is quoted as proving the untrustworthiness of Pytheas. *Mon. Hist. Brit.* xc.

was embroidered with gold.[1] Their shoes were open in front, and fastened round the ankle. Boadicea wore a many-coloured tunic, drawn closely around her bosom, and over this a mantle, with a gold collar or torque round the neck. In the tin districts black mantles were worn.[2] The natives of the interior wore skins in the days of Cæsar, and those of North Britain are described by Herodian and other writers as being half naked. Woad was used for staining the skin blue, and the figures of various animals are stated by the above-mentioned author[3] to have been tattooed on their bodies. The personal ornaments were the same as those described in the twelfth chapter. Their weapons were daggers, long iron swords, and short spears; small round targets also were used, and in the south oblong shields like those of the Gauls; helmets and breast-plates were unknown. Cavalry were used in warfare, and large numbers of chariots, like those of the Homeric heroes, drawn by small galloways, and sometimes bearing scythes on either side.[4]

The tribes of the south-eastern districts were, as might be expected from their contact with Gaul, and those of Cornwall from their intercourse with the Phœnician and Greek traders, more highly civilised than the other Britons. Coins were used as far north as York, but were not current among the Silures.[5] Many of the mines were worked in various parts of the country, and a brisk export trade was carried on not merely in

[1] Thurnam, *Crania Britannica*, i. p. 75.

[2] Strabo, *Mon. Hist. Brit.* v. [3] *Mon. Hist. Brit.* lxii.

[4] For these facts, see *Mon. Hist. Brit.*; also Thurnam, *Crania Britannica*, i. p. 85 *et seq.*

[5] Solinus, A.D. 80. See Evans, *Ancient British Coins*, c. i.

tin, but in gold, silver, iron, corn, and cattle, peltry, slaves, and hunting-dogs; the imports being, according to Diodorus Siculus, ivory bracelets, necklaces, amber, bronze wares, glass vessels, and "such like mean merchandise" from Gaul. This trade was sufficiently important to be taxed by Cæsar. British pearls also were known in Rome, and a breastplate inlaid with them, presented by Cæsar to Venus Genetrix, was preserved in Rome in her temple. Coracles, and boats made of osiers covered with hides, were employed in navigation, as well as wooden boats and ships; and in these the hardy natives of the west were in the habit of crossing over into Ireland. The tribes inhabiting Ireland were, as might be expected from their remoteness from the Continent, more rude and barbarous than those of Britain, although they belonged to the same races. Their ignorance of coins marks their lower position in the social scale.

Three, if not more, distinct peoples were in the British Isles at the time of the Roman conquest—(1) the small dark Iberians in the west, the remnants of the Neolithic aborigines; (2) their Celtic conquerors, who introduced a new civilisation from the Continent in the Bronze age, occupying by far the larger portion of the island; and (3) the Caledonians in the north, large-limbed, and with red hair, considered by Tacitus to be of Germanic origin.[1] The last are identified by Dr. Beddoe with the tall red-haired population in the east in Athole and Mar.[2] They probably arrived in Scotland

[1] Dr. Thurnam considers this a mere speculation of Tacitus. *Crania Brit.* i. p. 169. Jornandes notes the large size and red hair of the Caledonians, as well as the dark complexions and curly black hair of the Silures, *Mon. Hist. Brit.* lxxii. [2] *Proceed. Soc. Antiq. Scot.*, 1855.

from Scandinavia by the same route as the Norwegians in later times found their way into Caithness, setting sail from Thule, and making for the Orkneys. The Belgic Gauls also had crossed over from the opposite coasts of France, and had taken possession of the southern counties. They are not to be distinguished by any physical character from the Celtic peoples.

Roman Britain.

The Roman civilisation rapidly followed the Roman arms into Britain, and, although felt but to a slight degree between the invasion of Julius Cæsar and the conquest under Claudius, was carried by the policy of Suetonius and Agricola as far west as the Atlantic, and as far north as the Highlands of Scotland. The military occupation of the country led to the springing up of new towns, such as Chester, round the Roman camps, and the country was opened up by roads similar in their effects to the railways of the nineteenth century. Many of these are still in use. The strong central power which put an end to the rivalry between petty chieftains turned the attention of the people from war to agriculture, and Britain became one of the most important grain-producing countries in the Roman Empire.

The morasses were drained, forests cut down, and large tracts of land at the mouths of the rivers reclaimed from the tidal waters by the embankments which still do their work. The mineral wealth of the country was eagerly sought, not only the tin of Cornwall, or the iron of the Weald of Sussex, of the forest of Dean, and of the northern counties, but the gold and the copper of Wales, the lead of Derbyshire

and of Somerset, the jet of Yorkshire,[1] and the coal of Northumberland.[2]

The influence of Rome penetrated into every part of the country south of the Highlands, and the Roman villas, with their tesselated pavements, baths, columns, and statues, originally designed for the sunny skies of Italy, rose under the inclement skies of Northumberland, Lancashire, and Wales, and were very numerous in the southern districts. Latin was the official language, occupying the same relation to the British tongue that French held till recently in Russia, and Britain was a province in the same sense as Gaul and Spain, and became Christian like the rest of the empire by the edict of the Emperor Constantine.[3]

The Romans have also left their mark in the animals and plants which they naturalised in Britain. The fallow deer of southern Europe was introduced into the forests, the pheasant into the woodlands, and the hornless sheep, the goose, and the domestic fowl,[4] were added to the animals used for the table. The last two were, however, known before the days of Cæsar; but from some superstitious feeling were not eaten. The elm, now so common, may be inferred not to have existed in Britain before the Historic period, from its not occurring in the forests buried under peat or submerged beneath the sea, and was probably naturalised by the Romans.

[1] Solinus, c. 22. Priscianus, *Perieg.* v. 202. Isidorus, xiv. c. 6. Bæda, *Hist. Eccles.* i. 1.

[2] Cinders occur in the refuse-heaps of the Roman garrisons on the Roman Wall. See Bruce, *The Roman Wall.*

[3] Sozomen, i. c. 6.

[4] It is abundant in most Romano-British refuse-heaps.

The English Conquest.

The invasion of Gaul by the Goths was swiftly followed by that of Britain by the English, and the destruction of the Roman empire by that of the province of Britain. In the long and deadly warfare[1] which followed the landing of the three keels in the Isle of Thanet, in the year 449, the tide of conquest flowed steadily to the west, and the borders of England were enlarged until they extended to the western shores. The Roman civilisation was destroyed, the cities were burnt, their inhabitants driven away, until in the seventh century after Christ the Roman provincials were only represented by the Welsh of Cornwall, Wales, and Cumbria (Strathclyde). Christianity was replaced by the worship of Thor and Odin. The character of this conquest is eloquently described by Gildas,[2] by the metaphor that the flame kindled in the east raged over nearly all the land till it flared red over the western ocean. In 607 Æthelfrith advanced from the line of the Upper Trent on Chester, and the Northumbrian and British armies confronted each other. A body of monks from the monastery of Bangor[3] having come out to pray for victory over their enemies, Æthelfrith asked who they were, and on being told said, "If they fight against us with their prayers they are as truly our enemies as if they were armed," and began the battle by putting them to the sword. Bæda, who tells the story, says that eight hundred of them were killed. The British were routed, and Chester so ruthlessly destroyed, that

[1] For the history of this conquest see Freeman, *Early History of England*; Green, *History of the English People*.

[2] xxiv.

[3] Bæda, *Hist. Eccles.* i. 2. *Anglo-Saxon Chronicle.*

it lay desolate for nearly three centuries until it was rebuilt by Æthelflaed, the Lady of the Mercians. The slaughter of the monks of Bangor may be taken as an example of the fate of the British Christians, and the sack of Chester illustrates the treatment of the British towns and cities. The conflict between the two races did not lose its deadly character until the English became converts to Christianity.

The British, as they were gradually pushed westward, took refuge in Brittany and in Ireland, and under their influence the north of Ireland became a great centre from which Christianity[1] and civilisation spread not merely over a large part of England and Scotland, but over Scandinavia, Germany, and as far south as St. Galle. To them we owe the illuminated missals, the elaborate chalices, and the sculptured crosses in which the late Celtic designs are blended with the Germanic, introduced into Britain by the English, and into Ireland by the Danes and Norse.[2]

The English Breed of Cattle.

The English came over to Britain not as bodies of fighting men, but with their wives and families and household stuff; and the migration was so complete that, according to the *Anglo-Saxon Chronicle*, the Angleland which they forsook was left desolate for four centuries afterwards.[3] They effected as great a revolution in farming in Britain as in the language and whole political system, and with them appears, for the first

[1] See *Cave-hunting*, c. iii. [2] See pp. 443-4.

[3] *Anglo-Saxon Chronicle*, A.D. 449. The MS. A (*Mon. Hist. Brit.*) from which the statement is taken ends in A.D. 975.

time, the large breed of oxen from which, by a continual process of selection, our larger and more valuable breeds are descended.

The small Celtic short-horn was the only domestic breed known in Roman Britain, and its remains are exceedingly abundant in the refuse-heaps belonging to that period. Had any other large cattle been used, their bones would undoubtedly have been preserved in the same manner as those of all the other animals kept by the British farmers.

The first notice of cattle differing from the small dark Celtic short-horn is to be found in the Venedotian laws of Howel Dha, in which "white cows with red ears" are mentioned. These laws were codified in the tenth or eleventh century, but the customs to which they relate date back to a much earlier period. In a later translation of the Welsh laws, a hundred white cows with red ears are considered equal in value to a hundred and fifty black cattle. The white cattle are identical with those of Chillingham,[1] usually considered to be wild, but which more probably are their descendants, and have inherited their characters without change. It is not likely that so large an animal could have survived in Britain into the Historic period in a wild state, because its creamy-white colour would make it conspicuous to its enemies, and render concealment impossible in so densely-populated an island as Britain. These large cattle are distributed throughout every part of Britain conquered by the English, while the Celtic short-horn only survives in those parts in which the British had taken refuge. From these considerations it may be inferred that the

[1] Further details as to the English cattle are given in my *Preliminary Treatise, British Pleistocene Mammalia*, Palæont. Soc. 1878, p. xiv.

larger cattle represented by the breed of Chillingham were introduced by the English farmers into Britain, and probably by the Norwegians and Danes into Ireland.

The Vikings were in the habit of taking cattle on shipboard, and the Norwegian settlers in Iceland, in 874,[1] brought their cattle along with them. Thorsin, a wealthy Icelander, founded a colony in Vinland, taking with him sixty sailors, much cattle, and implements of husbandry.

From the English Conquest down to the present day the additions to our domestic animals have been few and unimportant. The ass[2] was known before A.D. 850, and the domestic cat was highly valued in Wales before the tenth or eleventh centuries.

The Extinction of the larger Wild Animals.

The wars which followed the invasion of Britain by the English delayed, in an important degree, the destruction of the larger and fiercer wild animals that found shelter in the uncultivated lands. The wolves increased in numbers after that time, and became sufficiently formidable to be worthy of special enactments in the days of Eadgar[3] and Edward the First. Those of Sussex devoured the bodies of the English slain on the battlefield of Senlac. They were exterminated in England about the end of the fourteenth century, in Scotland in 1680, and in Ireland in 1710. The bear has left no traces of his existence of a later date than the Roman occupation. The beaver was trapped for its fur

[1] Malet, *Northern Antiquities*, p. 291. 1770.

[2] Bell, *British Quadrupeds*, p. 386.

[3] For the authorities for these dates, see *Preliminary Treatise, British Pleistocene Mammalia*, Palæont. Soc., 1870, c. ii.

in the twelfth century in the river Teivi. The wild boar disappeared from England before the reign of Charles the First,[1] and lingered in the waste lands of Ireland into the next century. The reindeer was hunted by the jarls of Orkney in the remote north in Caithness[2] as late as the year 1159, while Henry the Second occupied the throne of England, and Alexander Neckam was writing his history. The gradual disappearance of these animals marks the increase of population, the cutting down of forests, the drainage of morasses, the multiplication of roads, by which man became master of the whole of the British Isles.

Conclusion.

It remains for us to sum up the principal results of our enquiry into Early Man in Britain. The succession of events from the beginning to the end of the Tertiary period has been treated; a succession in which each stage is intimately connected with that which went before and followed after. In the Eocene and Meiocene ages our islands formed part of a continent extending northwards to Iceland, Spitzbergen, and Greenland, with a warm climate and a luxuriant vegetation, inhabited by wild beasts belonging to extinct species. As none of the mammalia then alive are now living, it is unreasonable to suppose that man, the most highly specialised of all, should then have been on the earth. Nor is it likely

[1] He attempted to re-introduce them from the Continent.

[2] "Hreina," in the *Orkneyinga Saga.* For a criticism on this see *Pop. Science Rev.*, 1868, p. 42, and *Proceed. Soc. Antiq. Scot.* viii. p. 1, 1869.

that he lived in Europe in the Pleiocene age, after the land connecting Britain with Greenland had been submerged, and the Atlantic was united to the North Sea and the Arctic Ocean, because the living species of mammalia are so few. When the living species became abundant, he appears just in the Pleistocene stage in the evolution of mammalian life in which he might be expected to appear. The River-drift man first comes before us, endowed with all human attributes, and without any signs of a closer alliance with the lower animals than is presented by the savages of to-day; as a hunter, armed with rude stone implements, living not merely in Britain but throughout western and southern Europe, northern Africa, Asia Minor, and India. Next follows the Cave-man, possessed of better implements, and endowed with the faculty of representing animal forms with extraordinary fidelity, living in Europe north of the Alps and Pyrenees as far as Derbyshire, and probably belonging to the same race as the Eskimos. The disappearance of the Cave-man from Britain coincided with the geographical change by which it became an island, the change from a severe to a temperate climate, the extinction of some animals, and the retreat of others to northern and to southern regions. In the Prehistoric age the earliest of the present inhabitants arrived in Britain. The small, dark, non-Aryan peoples, who spread over France and Spain, brought with them into Britain the domestic animals and the cultivated plants and seeds, and laid the foundation of our present culture. The next invaders were the bronze-using Celtic tribes composing the van of the Aryan race. They crossed over from the Continent and introduced a higher civilisation than that of the Neolithic age. In the course of time

the use of iron became known, and in the Prehistoric Iron age the condition of Britain was higher than it had ever been before. A commerce was carried on with the Mediterranean peoples, and works of Etruskan art penetrated as far to the west as Ireland.

We have also noted the gradual disappearance of the wild animals, which stands in an inverse ratio to the increase in the domestic species.

The influence of the classical peoples of the Mediterranean on the nations of the north has also engaged our attention, and we have remarked the trade-routes by which Greek, Etruskan, and Phœnician commerce was carried on with the barbarians of the north, a commerce which was aimed more particularly at the gold, tin, and amber so eagerly sought in the ancient world. We have also traced the progress of discovery in the north-western seas by the Phœnicians and Greek mariners, and have only ended our enquiry with the circumnavigation of Britain in the time of Agricola. The Etruskans, from their commanding position in northern Italy, were most powerful in spreading civilisation northwards, in Gaul and Germany. Their influence was felt in Gaul in the Bronze age, and throughout Germany in the late Bronze and Iron ages. It is natural to suppose, also, that the Phœnicians, from their extended commerce, must have exercised a powerful influence on the peoples of Spain and of Gaul, but this it is impossible to trace, because they were mere manufacturers and merchants, without any art of their own. In later times the Greek influence became powerful in Gaul and Germany, penetrated into Britain, and was followed in due time by that of Rome. There is obviously a considerable overlap between the Historic period of the Mediterranean

and the Neolithic, Bronze, and Prehistoric Iron ages in central and northern Europe.

We found Britain at the beginning of our enquiry part of a continent, without human inhabitants; we leave it at the end an island, with its inhabitants and its condition to be dealt with by the historian. Each of the changes recorded has left its mark in the Britain of to-day, and so intimate is the continuity running through all the events, that the Tertiary period must be extended so as to embrace our own time. History takes up the story of human progress at the point where it is dropped by geology, archæology, and ethnology, and carries it on to the present day.

APPENDICES.

I. THE EOCENE MAMMALIA OF BRITAIN AND FRANCE.

A. *OF BRITAIN.*

B. *OF FRANCE.*

II. THE MEIOCENE MAMMALIA.

A. *THE LOWER MEIOCENE MAMMALIA OF FRANCE.*

B. *THE MID MEIOCENE MAMMALIA OF FRANCE.*

C. *THE UPPER MEIOCENE MAMMALIA OF THE CONTINENT.*

III. THE PLEIOCENE MAMMALIA.

A. *LOWER PLEIOCENE MAMMALIA OF FRANCE.*

B. *UPPER PLEIOCENE MAMMALIA OF FRANCE.*

C. *THE PLEIOCENE MAMMALIA OF ITALY.*

APPENDIX I.

CHAPTER II.—P. 26.

EOCENE MAMMALIA OF BRITAIN AND FRANCE.

A. *THE EOCENE MAMMALIA OF BRITAIN.*

THE following list, in which I have been largely assisted by Mr. William Davies of the British Museum, represents the principal Eocene Mammalia of Great Britain.

LOWER EOCENE.

MARSUPIALIA.

Didelphys Colchesteri, Ow. Woolwich and Reading beds, Kyson.

UNGULATA PERISSODACTYLA.

Hyracotherium leporinum, Ow. Woolwich and Reading beds, Kyson.
„ *cuniculus*, Ow. Woolwich and Reading beds, Kyson.
Coryphodon eocœnus, Ow. London Clay, Harwich.
Pliolophus vulpiceps, Ow. London Clay, Harwich.

MID EOCENE.

UNGULATA PERISSODACTYLA.

Lophiodon minimus, Ow. Bracklesham.

UPPER EOCENE.

MARSUPIALIA.

Didelphys. Hordwell.
Hyœnodon leptorhynchus, Blain.

UNGULATA PERISSODACTYLA.

Anchitherium radegondense, Gerv. Bembridge.
Palæotherium crassum, Cuv. Hordwell.
„ *magnum*, Cuv. Bembridge.
„ *medium*, Cuv. Binstead.
„ *minus*, Ow. Hordwell.
Paloplotherium annectens, Ow. Hordwell.

UNGULATA ARTIODACTYLA NON RUMINANTIA.

Anthracotherium. Hempstead, Bembridge.
Microchœrus erinaceus, S. V. Wood. Hordwell
Chœropotamus Cuvieri, Ow. Isle of Wight.
Hyopotamus bovinus, Ow. Hempstead.[1]
„ *vectianus*, Ow.
Dichodon cuspidatus, Ow. Hordwell.
Anoplotherium commune, Cuv. Binstead.

UNGULATA ARTIODACTYLA RUMINANTIA.

Dichobune ovinum, Ow. Binstead.
„ *cervinum*, Ow. Binstead.

RODENTIA.

Theridomys.

PRIMATES, LEMURIDÆ.

Acotherulum.

B. *THE EOCENE MAMMALIA OF FRANCE.*

The French Eocene Mammalia of the following list are taken principally from the works of Professor Gervais (*Paléontologie Française*, 4to, 1859, II. chap. 1), and Professor Gaudry (*Sur les Enchainements du Monde Animal*, 8vo, 1878).

LOWER EOCENE = ORTHROCÈNE, Gervais, p. 324.

MARSUPIALIA CARNIVORA.

Arctocyon primævus, Gerv. *Palæonictis gigantea*, Blain.

[1] The age of the Hempstead beds is under discussion. In the text it is treated as Meiocene.

HERBIVORA PERISSODACTYLA.

Coryphodon anthracoideum, Ow.

MID EOCENE MAMMALIA = EOCÈNE, Gervais, p. 327.

HERBIVORA PERISSODACTYLA.

Lophiodon, 10 species. *Propalæotherium*, 2 species.
Pachynolophus, 5 „

HERBIVORA ARTIODACTYLA.

Anchilophus. *Heterohyus*.

RUMINANTIA.

Dichobune.

UPPER EOCENE = PROICÈNE, Gervais, p. 328.

MARSUPIALIA.

Didelphys, Cuv. = *Peratherium*, Gerv., 5 species.
Proviverra Cayluxi, Gaudry.[1]
Hyænodon, 3 species.
Pterodon dasyuroides, Blain.

UNGULATA PERISSODACTYLA.

Anchitherium (?) *Dumasii*, Gerv. *Paloplotherium*, 2 species.
„ *radegondense*, Gerv. *Lophiotherium cervulum*, Gerv.
Palæotherium, 6 species.

UNGULATA ARTIODACTYLA.

Anoplotherium commune, Cuv. *Chœropotamus parisiensis*, Cuv.
Eurytherium latipes, Gerv. *Cebochœrus*, 2 species.

UNGULATA ARTIODACTYLA RUMINANTIA.

Amphimœryx, 2 species. *Cainotherium* (*Hyægulus*), 2 species.
Dichobune leporinum, Cuv. *Xiphodon*, 3 species.

[1] *Les Enchainements*, c. 1.

CARNIVORA (MARSUPIALIA ?).

Canis (?) parisiensis,[1] Cuv.
Cynodictis lacustris, Gerv.
Cyotherium parisiense, Gerv.
Galéthylax Blainvillei, Gerv.
Tylodon Hombresii, Gerv.

RODENTIA.

Plesiarctomys Gervaisii, Brav.
Sciurus fossilis,[1] Cuv.
Theridomys, 2 species.

CHEIROPTERA.

Vespertilio Parisiensis.[2]

PRIMATES, LEMURIDÆ.

Adapis parisiensis, Cuv.
Adapis (*Aphelotherium*) *Duvernoyi*, Gaudry.
Acotherulum.
Tapirulus hyracinus, Gerv.

[1] This Eocene genus is too imperfect to be satisfactorily defined.
[2] This Eocene genus has not been satisfactorily defined.

APPENDIX II.

CHAPTER III.—P. 39.

THE MEIOCENE MAMMALIA.

A. *THE LOWER MEIOCENE MAMMALIA OF FRANCE.*

THE mammals which appear to me to characterise the Lower Meiocenes[1] of France are chosen from Professor Gervais' work (*Op. cit.* pp. 341 *et seq.*) They consist of the following species derived from—1. St. Gérand-le-Puy (Allier); 2, Vaumas and St. Pourcin-Sur-Hètre (Allier); 3, Issoire, Volvic, Puy-de-dome.

LOWER MEIOCENE MAMMALIA OF FRANCE.

MARSUPIALIA.

Didelphys = Peratherium (3).[2]
Hyænodon leptorhynchus, Laiz. (3).

UNGULATA PERISSODACTYLA.

Rhinoceros minutus (3), Cuvier.
Tapirus Poireri (2), Pomel.

[1] The mammalia of Ronzon, Villebramar, and Le Puy-en-Velay, considered by Professor Gaudry (*Les Enchainements*, p. 5, and *Les Animaux Fossiles de Mont Léberon*, 4to, p. 86) to belong to a still lower stage of the Meiocene, will probably ultimately be classified with the Upper Eocene, as Professor Gervais suggests, *Pal. Franç.* p. 334.

[2] These numbers relate to the above localities.

UNGULATA ARTIODACTYLA.

Palæochœrus (*Hyotherium*) (1), (3).
Anthracotherium magnum (3), Cuv.
Hyopotamus borbonicus (2), Gerv.

UNGULATA ARTIODACTYLA RUMINANTIA.

Dremotherium Feignouxii, Geoff. (1), (3).
Amphitragulus elegans, Pomel. (1), (3).
Cainotherium commune, Gerv. (1), (3).
Synaphodus brachygnathus, Pomel. (3).

CARNIVORA.

Amphicyon gracilis, Pomel. (1).
„ *brevirostris*, Gerv. (3).
Viverra primæva, Pomel. (3).
„ *antiqua*, Blain. (1).
Potamotherium Valetoni, Gerv. (1).
Mustela plesictis, Laiz. (1).
Mustela Croizeti, Pomel. (3).
„ *elegans*, Gerv. (1).
„ *sectoria*, Gerv. (3).
„ *angustifrons*, Gerv. (1).
„ *minuta*, Gerv. (1).

RODENTIA.

Steneofiber viciacensis, Gerv. (1).
Sciurus, (1).
Theridomys breviceps, Gerv. (3).
„ *Blainvillei*, Gerv. (3).
Myoxus murinus, Pomel. (1).
Cricetodon, (3).
Titanomys visenoviensis, Meyer (1).

INSECTIVORA.

Erinaceus arvensis, Blain. (3).
Myogale naiadum, Pomel. (3).
Plesiosorex soricinoides, Gerv. (3).
Mysarachne Picteti, Pomel. (3).
Sorex antiquus, Pomel. (1).
Talpa acutidentata, Blain. (3).
„ *antiqua*, Blain. (3).

B. *THE MID MEIOCENE MAMMALIA OF FRANCE.*

The mid Meiocene mammalia of France are represented by the species found at (1) Sansan, (2) Simorre (Gervais, *Pal. Fr.* pp. 341 *et seq.*)

MID MEIOCENE MAMMALIA OF FRANCE.

EDENTATA.

Macrotherium giganteum, Lart. (1).

Proboscidea.

Mastodon angustidens, Cuv.
„ *tapiroides*, Cuv. (1), (2).
Deinotherium intermedium, Kaup. (2).

Ungulata Perissodactyla.

Anchitherium aurelianense, Gerv. (1).
Rhinoceros brachypus, Lart. (2).
„ *sansaniensis*, Lart. (1).
Rhinoceros cimogorrhensis, Lart. (2).
Aceratherium tetradactylus, Lart. (2).

Ungulata Artiodactyla.

Sus chœrotherium, Blain. (1).
„ *lemuroides*, Blain. (1).
Chœromorus simplex, Gerv. (1).
Listriodon splendens, Meyer (2).
Chalicotherium grande, Gerv. (1).

Ungulata Artiodactyla Ruminantia.

Antilope clavata, Gerv. (1).
Dicroceros elegans, Lart. (1).
Micromeryx Flourensianus, Lart. (1).

Carnivora.

Hyœnarctos hemicyon, Lart. (1).
Amphicyon zibethoides, Blain. (1).
Thalassictis (?) *incerta*, Lart. (1).
Viverra sansaniensis, Lart. (1).
„ *exilis*, Blain. (1).
Felis media, Lart. (1).
Machairodus palmidens, Gerv. (1).
Pseudælurus quadridentatus, Gerv. (1).
Lutra dubia, Blain. (1).
Mustela hydrocyon, Lart. (1).
„ *taxodon*, Lart. (1).
„ *genettoides*, Lart. (1).
„ *zorilloides*, Lart. (1).

Rodentia.

Castor subpyrenaicus, Lart. (2).
Steneofiber sansansiensis, Gerv. (1).
Sciurus „ Lart. (1).
„ *Gervaisianus*, Lart. (1).
Myoxus sansaniensis, Lart. (1).
Cricetodon sansaniense, Lart. (1).
„ *medium*, Lart. (1).
„ *minus*, Lart. (1).

(TITANOMYS).

Lagomys sansaniensis, Lart. (1).

INSECTIVORA.

Erinaceus sansaniensis, Lart. (1).
Mygale sansaniensis, Lart. (1).
Talpa sansaniensis, Lart. (1)
„ *minuta*, Blain. (1).

CHEIROPTERA.

Vespertilio noctuloides, Lart. (1).
„ *murinoides*, Lart. (1).

PRIMATES, SIMIADÆ.

Pliopithecus antiquus, Gerv. (1).
Dryopithecus Fontani, Lart. (St. Gaudens).

C. *THE UPPER MEIOCENE MAMMALS OF THE CONTINENT.*

The following Table of Upper Meiocene species of France, Spain, Greece, and Germany, is taken from the works of Professor Gaudry.[1] From it the reader will gather the distribution of the various species in different parts of Europe.

	France: Vaucluse, Mont Léberon.	Spain: Concud.	Greece: Attica, Pikermi.	Hungary: Baltavar.	Germany: Hesse-Darmstadt, Eppelsheim.
EDENTATA.					
Ancylotherium pentelici, Gaudry	...	...	×	...	×
Macrotherium . . .	...	...	...		
PROBOSCIDEA.					
Mastodon pentelici, Gaudry and Lartet . . .	...	×	×		
Mastodon turicensis, Schinz .	...	...	×	...	×
„ *longirostris*, Kaup. .	...	...	...	×	×
Deinotherium giganteum, Kaup.	×	...	×		
PERISSODACTYLA.					
Rhinoceros pachygnathus, Wagner . .	...	...	×	...	×
„ *Schleiermacheri*, Kaup.	×	...	×	...	×
Aceratherium . . .	×	...	×		
Leptodon græcus, Gaudry .	...	...	×	×	×
Hipparion gracile, Christol .	×	×	×	...	×
Tapirus	...	...	...		
ARTIODACTYLA.					
Chalicotherium . . .	×	...	...	...	×
Sus erymanthius . } Kaup. „ *major*, Gerv. = var. }	×	...	×	×	
„ *palæochœrus*, Kaup. . .	...	...	...	...	×
„ *antediluvianus*, Kaup. .	...	...	...	...	×
„ *antiquus*, Kaup. . .	...	...	...	...	×
RUMINANTIA.					
Camelopardalis attica, Gaudry and Lartet . . .	...	...	×		
Helladotherium Duvernoyi, Gaudry	×	...	×	×	

[1] *Les Animaux Fossiles et la Géologie de l'Attique*, 1862-8; and *Les Animaux Fossiles de Mont Léberon*, 4to.

	France: Vaucluse, Mont Léberon.	Spain: Concud.	Greece: Attica, Pikermi.	Hungary: Baltavar.	Germany: Hesse-Darmstadt, Eppelsheim.
RUMINANTIA—*continued.*					
Palæotragus Rouenii, Gaudry	...	...	×		
Palæoryx Pallasii, Gaudry	...	...	×		
Tragoceros amaltheus, Gaudry	×	×	×	×	
Tragoceros Valenciennesi, Gaudry	...	...	×		
Palæoreas Lindermayeri, Gaudry	...	...	×		
Antedorcas (?) *Rothii*, Gaudry	...	...	×		
Gazella brevicornis, Gaudry	...	×	×	×	
„ *deperdita*, Gaudry	×	×	×	×	
Dremotherium pentelici, Gaudry	...	...	×	...	×
Dorcatherium	...	...	...	...	×
Cervus Matheroni, Gerv.	×				
„ *anoceros*, Kaup.	...	...	...	...	×
„ *dicranoceros*, Kaup.	...	...	...	...	×
CARNIVORA.					
Simocyon diaphorus, Gaudry	...	...	×	...	×
Mustela pentelici, Gaudry	...	...	×		
Promephitis Lartetii, Gaudry	...	...	×		
Ictitherium robustum, Gaudry	...	...	×		
„ *hipparionum*, Wagner	×	...	×	×	
„ *Orbignii*, Wagner	× (?)	...	×		
Hyæna eximia, Roth. and Wagner	×	×	×		
„ *chœretis*, Gaudry and Lartet	...	...	×	×	
Hyænictis græca, Gaudry	...	...	×	×	×
Machairodus cultridens, Kaup.	×	...	×		
Felis attica, Gaudry	...	...	×		
RODENTIA.					
Hystrix primigenia, Gaudry	...	...	×		
PRIMATES, SIMIADÆ.					
Mesopithecus pentelici, Wagner	...	...	×		
Dryopithecus (?)	...	...	...	...	×

APPENDIX III.

CHAPTER IV.—P. 79.

THE PLEIOCENE MAMMALIA.

THE following Lists of the Pleiocene mammalia are founded upon those published by Professor Gervais (*Zool. et Paléont. Franç.* p. 349 *et seq.*), with the addition of certain species which have been determined by Dr. Falconer, Dr. Forsyth Major, and myself.

A. *LOWER PLEIOCENE MAMMALS OF FRANCE, STAGE OF MONTPELLIER.*

LAND.

PROBOSCIDEA.

Mastodon arvernensis, Falc. = *M. brevirostris*, Gerv.

UNGULATA PERISSODACTYLA.

Rhinoceros megarhinus, Christol. *Tapirus minor*, Serres.

UNGULATA ARTIODACTYLA.

Sus provincialis, Gerv.

UNGULATA ARTIODACTYLA RUMINANTIA.

Antilope Cordieri, Christ.
Cervus cusanus, Cr. et Job.
„ *australis*, Serres.

CARNIVORA.

Ursus minutus, Gerv. (? *Ursus arvernensis*, Cr. et Job.)
Hyœnarctos insignis, Gerv.
Felis Christolii, Gerv
Lutra affinis, Gerv.

RODENTIA.

Chalicomys sigmodus, Gerv.
Lagomys loxodus, Gerv.

PRIMATES, SIMIADÆ.

Semnopithecus monspessulanus, Gerv.
Macacus priscus, Gerv.

SEA.

Pristiphoca occitana, Gerv.
Halitherium Serresii, Gerv.
Delphinus pliocœnus, Gerv.
Rorqualis priscus, Gerv.
Hoplocetus curvidens, Gerv.

B. *UPPER PLEIOCENE MAMMALIA OF FRANCE, STAGE OF MONT PERRIER AND ISSOIRE.*

PROBOSCIDEA.

Mastodon arvernensis, Cr. et Job.
Elephas meridionalis (of Malbattu), Nesti.

UNGULATA PERISSODACTYLA.

Rhinoceros (elatus ?).
Tapirus arvernensis, Cr. et Job.
Hipparion gracile (of Malbattu), Kaup.

UNGULATA ARTIODACTYLA.

Sus arvernensis, Cr. et Job.

UNGULATA ARTIODACTYLA RUMINANTIA.

Bos elatus, Croiz.
Cervus polycladus, Gerv.
(= *C. ramosus*, Cr. et Job.)
Cervus ardeus, Cr. et Job.
„ *polignacus*.
Cervus etueriarum, Cr. et Job.
„ *pardinensis*, Cr. et Job.
„ *arvernensis*, Cr. et Job.
„ *cusanus*, Cr. et Job.

Cervus cladocerus, Pomel.
„ *perrieri*, Cr. et Job. (= *C. issiodorensis.*)
Cervus tetraceros, Dawk.
„ *cylindroceros*, Dawk.[1]

CARNIVORA.

Ursus arvernensis, Cr. et Job.
Canis borbonicus, Brav.
Felis pardinensis, Cr. et Job.
„ *arvernensis*, Cr. et Job.
„ *brevirostris*, Cr. et Job.
Felis issiodorensis, Cr. et Job.
Machairodus cultridens, Gerv.
Hyæna arvernensis, Cr. et Job.
„ *perrieri*, Cr. et Job.
Lutra Bravardi, Pomel.

RODENTIA.

Hystrix refossa, Gerv.
Castor issiodorensis, Croizet.
Arctomys antiqua, Pomel.
Arvicola robustus, Pomel.
Lepus Lacosti, Pomel.

C. *PLEIOCENE MAMMALIA OF ITALY, THE UPPER VAL D'ARNO.*

(Forsyth Major, *Soc. Ital. di Antrop et di Etnol.*, 20th April 1876, p. 10.)

PROBOSCIDEA.

Mastodon arvernensis, Cr. et Job.
Elephas meridionalis, Nesti.

UNGULATA PERISSODACTYLA.

Rhinoceros etruscus, Falc.
„ *megarhinus*, Falc.
Equus Stenonis, Cocchi.

UNGULATA ARTIODACTYLA.

Hippopotamus major, Cuv.
Sus Strozzi, Meneg.

[1] Dawkins, *Quart. Journ. Geol. Soc. Lond.* xxxiv. p. 402.

UNGULATA ARTIODACTYLA RUMINANTIA.

Bos etruscus, Falc.
Cervus ctenoides, Nesti (MSS.)
C. perrieri, Cr. et Job.
Cervus dicranios, Nesti.
Cervus etueriarum, Cr. et Job.

CARNIVORA.

Canis etruscus, Major.
Ursus etruscus, Cuv.
Hyæna perrieri, Cr. et Job.
Felis.
Canis Falconeri, Major.
Mustela.
Machairodus (3 sp.)

RODENTIA.

Castor plicidens, Major.
„ *rosiniæ*, Major.
Hystrix.
Lepus.

PRIMATES, SIMIADÆ.

Macacus (*Aulaxinus*), Cocchi.
Macacus, Sp.

The *megarhine Rhinoceros* has been determined by Dr. Falconer. the *Cervus etueriarum* and *C. perrieri* by myself, the former in the Geological Museum of the University of Bologna, and in the Castello Valentino in Turin, and the latter in the Museum of the University of Florence. In the last museum there are specimens of *Machairodus latidens*, Ow., and *M. cultridens* of Kaup.

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Government of Maharashtra
on 18 July, 2018